

# Remedial Action Work Plan

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## Flushing Commons Phase 1A

38-18 Union Street

Flushing, NY 11354

Block 4978, Lot 25

NYC VCP Number: 14CVCP191Q

OER Project Number: 14RHAN223Q

AKRF Project Number: 10677

CEQR Number 06DME010Q

NYCDEP File 06DEPTECH098Q

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**JANUARY 2014**

# REMEDIAL ACTION WORK PLAN

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## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound

OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

## CERTIFICATION

I, Michelle Lapin of AKRF, Inc., am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the Flushing Commons Phase 1A Site NYC VCP number 14CVCP191Q and OER project number 14RHAN223Q.

I, Stephen Malinowski am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the Flushing Commons Phase 1A Site number NYC VCP number 14CVCP191Q and OER project number 14RHAN223Q.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Michelle Lapin  
Name

073934  
NYS PE License Number

*Michelle Lapin*  
Signature

1-17-14  
Date



Stephen T. Malinowski  
QEP Name

*Stephen T. Malinowski*  
QEP Signature

01-17-14  
Date



## **EXECUTIVE SUMMARY**

Flushing Commons, LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 67,600-square foot site located at 38-18 Union Street in Flushing, New York. A Phase II investigation was performed in 2006 to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in accordance with the requirements of the Mayor's Office of Environmental Remediation (OER). Due to Site access issues, additional remedial investigation (RI) activities are included in the first phase of this RAWP to provide supplemental soil, groundwater, and soil vapor data to further evaluate subsurface conditions prior to soil disturbance activities. The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

### **SITE LOCATION AND CURRENT USAGE**

The Flushing Commons Site is bounded by 37<sup>th</sup> Avenue, Union Street, 39<sup>th</sup> Avenue, and 138<sup>th</sup> Street in the Flushing section of Queens, NY and is identified as Block number 4978, Lot 25. Currently the majority of the Flushing Commons Site is utilized for automotive parking except for the northeast portion of the block, which is occupied by the Macedonian African Methodist Episcopal Church building and parcel. The Flushing Commons Site is scheduled to undergo redevelopment in phases; the first stage of the development process is Phase 1A. Phase 1A consists of an approximate 67,600-square foot portion of the Flushing Commons site situated on the corner nearest 39<sup>th</sup> Avenue and Union Street (the Site). The location of the Site is provided as Figure 1.

The surface topography of the project site is generally level, sloping gently down to the west. Based on the U.S. Geological Survey Flushing, New York topographic map, the property lies at an elevation of approximately 50 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level). Based on a Geotechnical Engineering Study by

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C dated June 10, 2013, the approximate depth to groundwater is expected to be between 40 and 50 feet below grade. Groundwater was observed between 45-48 feet below grade during a Phase II Subsurface Investigation conducted by AKRF, Inc. in 2006.

## **SUMMARY OF PROPOSED REDEVELOPMENT PLAN**

The proposed development plan for the Flushing Commons site comprises a mix of uses, including residential, retail, restaurant, common space, a large non-profit health club (e.g., YMCA), and medical offices. The proposed redevelopment for the Site as part of Phase 1A consists of the construction of two mixed-use buildings (Buildings C and D) with a footprint area at grade of 41,153 square feet and four levels of subgrade parking containing 1,007 parking spots. The cellar area is 67,670 square feet. The first floors of buildings C and D include loading areas, an office lobby, residential lobby, retail and an open space plaza with an approximately 25,517-square foot landscape area on the ground floor above the parking garage. The second floor of each building includes retail establishments and the third floor contains office space. Floors 4 through 17 in building C are designed for residential use and the 4<sup>th</sup> through 13<sup>th</sup> floors in building D are designed for commercial/office use. A residential amenity roof is planned for the 4<sup>th</sup> floor. The total gross building square footage is 696,432.

The construction plan includes full build-out of the Site with excavation to approximately 47-50 feet below grade to construct the below-grade parking structure. Partial demolition of the existing steel garage structure will be necessary to facilitate the excavation. The excavation is planned to extend up to 50 feet below grade for the building's spread footings and terminate at and/or in the water table. It is estimated that approximately 178,000 tons of soil will require excavation and off-site disposal during the foundation excavation. Architectural drawings of the proposed redevelopment for Phase 1A are included in Appendix 1. The zoning designation is C4-4.

## **SUMMARY OF THE REMEDY**

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic compounds.
3. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
4. Implementation of the NYC OER-approved supplemental Remedial Investigation Work Plan dated November 2013.
5. Preparation and submission of Remedial Investigation Report (RIR) to NYC OER documenting the results of additional soil, soil vapor and groundwater specified in the Remedial Investigation Work Plan (RIWP). Updating of this Remedial Action Work Plan (RAWP), if required based upon the results of RIR.
6. Establishment of Unrestricted Use Track 1 Soil Cleanup Objectives (SCOs).
7. Excavation and removal of soil/fill exceeding Unrestricted Use SCOs. For development purposes, the Site will be excavated to an approximate depth of 47-50 feet throughout the property.

8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Transportation and off-site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-site.
10. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if encountered) in compliance with applicable local, State and Federal laws and regulations.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
12. As part of construction, installation and maintenance of an engineered composite cover consisting of the 12-inch concrete building slab and four levels of ventilated subgrade automotive parking.
13. As part of construction, installation of a waterproofing system beneath the building slab and along outside foundation sidewalls below grade. The water barrier will consist of Grace Preprufe 160R along the foundation walls and Grace Preprufe 300R below the lowest level horizontal slab. While not required for a Track 1 cleanup, the waterproofing system would also serve as a vapor barrier to protect against intrusion of soil gas from off-site sources.
14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
15. Implementation of stormwater pollution prevention measures in compliance with applicable laws and regulations.
16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

17. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and, if Track 1 SCOs are not achieved, describes all Engineering and Institutional Controls to be implemented at the Site.

## COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation (OER) created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the Site, and describes the plans to clean up the Site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities. This cleanup plan also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

**Remedial Investigation and Cleanup Plan.** Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) will be performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. While some investigation has already been conducted, the cleanup plan has been designed to address all contaminant sources that are anticipated during the further study of this property.

**Identification of Sensitive Land Uses.** Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

**Qualitative Human Health Exposure Assessment.** An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential

for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

**Health and Safety Plan.** This cleanup plan includes a Health and Safety Plan that is designed to protect community residents and on-site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

**Site Safety Coordinator.** This project has a designated Site Safety Coordinator to implement the HASP. The Site Safety Coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site Safety Coordinator is Robert Andrews and can be reached at (646) 315-2616.

**Worker Training.** Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

**Community Air Monitoring Plan.** Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYC OER. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

**Odor, Dust and Noise Control.** This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact AKRF's Project Manager Stephen Malinowski at 631-574-3724 or

NYC OER Project Shana Holberton at 212-788-3220.

**Quality Assurance.** This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC OER and will be thoroughly reviewed.

**Stormwater Management.** To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

**Hours of Operation.** The hours for operation of cleanup will comply with the NYC Department of Buildings (DOB) construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to the DOB construction code requirements or according to specific variances issued by DOB.

**Signage.** While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC VCP, provides project contact names and numbers, and locations of project documents can be viewed.

**Complaint Management.** The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the Owner's Representative Wendy Castro-Farrell of Flushing Commons, LLC at 212-282-2016, the NYC OER Project Manager Shana Holberton at 212-788-3220, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

**Utility Mark-outs.** To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC DOB regulations.

**Soil and Liquid Disposal.** All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

**Soil Chemical Testing and Screening.** All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

**Stockpile Management.** Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect stormwater catch basins and other discharge points.

**Trucks and Covers.** Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

**Imported Material.** All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

**Equipment Decontamination.** All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

**Housekeeping.** Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

**Truck Routing.** Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

**Final Report.** The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at The Queens Library at Flushing.

**Long-Term Site Management.** If long-term protection is required after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

# **REMEDIAL ACTION WORK PLAN**

## **1.0 SITE BACKGROUND**

Flushing Commons, LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 38-18 Union Street in Flushing, New York (the Site). A Phase II Investigation was performed in 2006 to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. Due to Site access issues, additional remedial investigation (RI) activities are included in the first phase of this RAWP to provide supplemental soil, groundwater, and soil vapor data to further evaluate subsurface conditions prior to soil disturbance activities. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

### **1.1 Site Location and Current Usage**

The Flushing Commons site is bounded by 37<sup>th</sup> Avenue, Union Street, 39<sup>th</sup> Avenue, and 138<sup>th</sup> Street in the Flushing section of Queens, NY and is identified as Block number 4978, Lot 25. Currently, the majority of the Flushing Commons Site is utilized for automotive parking, except for the northeast portion of the block, which is occupied by the Macedonian African Methodist Episcopal Church building and adjacent paved parcel. The Flushing Commons Site is scheduled to undergo redevelopment in phases; the first stage of the development process is Phase 1A, which consists of an approximate 67,600-square foot portion of the Flushing Commons Site situated on the corner nearest 39<sup>th</sup> Avenue and Union Street (the Site). The location of the Flushing Commons Site is provided on Figure 1. A Site Plan is provided as Figure 2. Groundwater was observed between 45-48 feet below grade during a Phase II Subsurface Investigation conducted by AKRF, Inc. in 2006.

The surface topography of the project site is generally level, sloping gently down to the west. Based on the U.S. Geological Survey Flushing, New York topographic map, the property lies at an elevation of approximately 50 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level). Based on a Geotechnical Engineering Study by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. dated June 10, 2013, the approximate depth to groundwater is expected to be between 40 and 50 feet below grade.

## **1.2 Proposed Redevelopment Plan**

The proposed development plan for the Flushing Commons Site comprises a mix of uses, including residential, retail, restaurant, common space, a large non-profit health club (e.g., YMCA), and medical offices. The proposed redevelopment for the Site as part of Phase 1A consists of the construction of two mixed-use buildings (Buildings C and D) with a footprint area at grade of 41,153 square feet and four levels of subgrade parking containing 1,007 parking spots. The cellar area is 67,670 square feet. The first floor of buildings C and D include loading areas, an office lobby, residential lobby, retail and an open space plaza with an approximately 26,517-square foot landscape area on the ground floor above the parking garage. The second floor of each building includes retail establishments and the third floor contains office space. Floors 4 through 17 in building C are designed for residential use and the 4<sup>th</sup> through 13<sup>th</sup> floors in building D are designed for commercial/office use. A residential amenity roof is planned for the 4<sup>th</sup> floor. The total gross building square footage is 696,432.

The construction plan includes full build-out of the Site with excavation to approximately 47-50 feet below grade to construct the below-grade parking structure. Partial demolition of the existing steel garage structure will be necessary to facilitate the excavation. The excavation is planned to extend up to 50 feet below grade for the building's spread footings and terminate at and/or in the water table. It is estimated that approximately 178,000 tons of soil will require excavation and off-site disposal during the foundation excavation. Architectural drawings of the proposed redevelopment for Phase 1A are included in Appendix 1. The current zoning designation is C4-4.

### **1.3 Description of Surrounding Property**

The Flushing Commons site is bounded to the north by 37<sup>th</sup> Avenue, to the east by Union Street, to the south by 39<sup>th</sup> Avenue and to the west by 138<sup>th</sup> Street. The Macedonian African Methodist Episcopal (A.M.E.) Church is east-adjacent to the development site and the only other property on the block not part of the parking facility. To the north, across 37<sup>th</sup> Avenue, there is an 11-story residential complex. The New York Police Department 109<sup>th</sup> Precinct is east of the subject property, across Union Street. The remainder of the properties surrounding the Site are primarily residential and commercial/retail properties. According to OER's SPEED online application, a daycare facility, Macedonia Child Development Center, is located within the adjacent A.M.E. Church. There are no other day care facilities, hospitals, or schools within a 500-foot radius of the Site. Figure 3 depicts surrounding land usage.

### **1.4 Phase II Subsurface Investigation**

AKRF completed a Phase II Subsurface Investigation for the overall Flushing Commons property in 2006, which includes the Phase 1A Site. The investigation included the advancement of 11 soil borings, and the collection of 22 soil samples and two groundwater samples for laboratory analysis. Historic fill material was present in soil directly beneath the asphalt surface, but was generally no more than one foot thick.

The AOCs identified for this Site included:

1. Historic fill layer is present at the Site from grade to depths of approximately one foot below grade.

### **Summary of the Work Performed under the Phase II Subsurface Investigation**

1. Installation of 11 soil borings across the entire Flushing Commons property (three of which were installed on the Phase IA Site), and collection of 22 soil samples for chemical analysis from the soil borings to evaluate soil quality; and
2. Installation of two temporary groundwater monitoring well points at the Flushing Commons property (one of which was installed on the Phase IA Site), and collection of two groundwater samples for chemical analysis to evaluate groundwater quality.

### **Summary of Environmental Findings**

1. Elevation of the Flushing Commons property is approximately 50 feet above the Nation Geodetic Vertical Datum of 1929 (an approximation of mean sea level).
2. Depth to groundwater at the Flushing Commons property is approximately 45-48 feet below grade at the Site.
3. Groundwater flow is generally from southeast to northwest beneath the Site.
4. Depth to bedrock is at the Site is greater than 100 feet.
5. The stratigraphy of the Flushing Commons property, from the surface down, consists of approximately one-foot of historic fill underlain by a native brown silty sand.
6. Soil/fill samples collected during the Phase II showed no volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) or pesticides detections in any of the soil samples. Semivolatile organic compounds (SVOCs) were detected in only one location of the Phase 1A Site. All SVOCs were detected at concentrations below the New York State Department of Environmental Conservation (NYSDEC) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs). Metals were detected in most of the soil samples from the overall Flushing Commons property, but generally at concentrations either below the Unrestricted Use SCOs or within normal background levels encountered in eastern U.S. and New York State soils. Lead [maximum of 300 milligrams per kilogram (mg/Kg)] and nickel (maximum of 36 mg/Kg) were each found in three of the samples above the Unrestricted Use SCOs but below the Restricted Residential SCOs. The maximum lead concentration of 300 mg/Kg was reported in sample SS-7 (0.5'-2') collected on the Phase 1A Site. Overall, the findings were consistent with observations for historical fill sites in areas throughout NYC.
7. Groundwater samples collected during the Phase II study showed methyl tert-butyl ether (MTBE), a common additive to gasoline, in MW-4, north of the Phase IA Site boundary, at a concentration of 15 parts per billion (ppb), exceeding the NYS 6NYCRR Part 703.5 Groundwater Quality Standards (GQS) of 10 ppb. Several chlorinated solvents were detected at trace concentrations in both groundwater samples, but only tetrachloroethene

(PCE) at a concentration of 12 ppb, exceeded its GQS in the groundwater sample collected at M-4. SVOCs including benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene, were detected in both groundwater samples, but only exceeded the GQS in sample MW-4. The on-site well did not show any exceedance for VOCs, SVOCs, pesticides or PCBs. PCBs and pesticides were not detected above method detection limits in either sample. Total and dissolved metals were detected in both samples, above GQS. Dissolved metals exceeding the GQS included barium, chromium, copper, iron, lead, magnesium, nickel, and sodium. The detected compounds and metals were attributable to entrained sediment and/or regional groundwater quality and not to an on-site release.

8. Soil vapor samples were not collected during Phase II investigation. Soil vapor samples will be collected prior to redevelopment.

### **1.5 Remedial Investigation**

The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations. Based on the findings of the additional investigation activities, the proposed remedial action may be amended; however, site development includes full excavation to the depths of 47 to 50 feet below grade, and will ensure protection of public health and the environment consistent with the intended property use.

Supplemental RI activities will be performed during the initial phase of this RAWP to provide additional soil, groundwater, and soil vapor data to further evaluate subsurface conditions prior to soil disturbance activities. The scope of work for the additional investigation activities are detailed in an OER-approved are detailed in a Remedial Investigation Work Plan submitted to NYC OER in November 2013 (Appendix 2).

For more detailed results, consult the 2006 Phase II Subsurface Investigation Report. Based on an evaluation of the data and information from the Phase II and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

## **2.0 REMEDIAL ACTION OBJECTIVES**

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

### **2.1 Groundwater**

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to potential off-site contaminants volatilizing from groundwater.

### **2.2 Soil**

- Prevent direct contact with contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

### **2.3 Soil Vapor**

- Prevent exposure to potential contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

### **3.0 REMEDIAL ALTERNATIVES ANALYSIS**

The goal of the remedy selection process under is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Land use; and
- Sustainability.

One remedial Alternative was developed to achieve the remedial action objectives established for the Site, as described in this section. This remedial plan consists of a Track 1 Cleanup which is the highest standard for cleanup available in the Voluntary Cleanup Program (VCP) and does not require consideration of lesser cleanup alternatives.

#### **Track 1 Cleanup**

The Track 1 alternative would result in excavation and removal of all soil/fill with contaminant concentrations above Track 1 SCOs. As part of development, a building slab would be placed on all land surfaces and a waterproofing system would be installed. While not

required as part of a Track 1 cleanup, the waterproofing system would also act as a vapor barrier to prevent any potential future intrusion from off-site soil vapors. This alternative would be consistent with the RAOs and provide overall protection of public health and the environment from on-site derived contamination in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- Eliminating potential future exposures to off-site soil vapors.

The proposed development would include removing the urban historic fill and all other soils from the entire Site to a depth up to 50 feet below sidewalk-level grade. A thin layer of fill material was observed in the top foot of material below the asphalt surface of the Site during the Phase II and geotechnical testing activities.

### **3.1 Threshold Criteria**

#### **3.1.1 Protection of Public Health and the Environment**

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

The remedial plan would provide overall protection of public health and the environment because all contaminants exceeding Track 1 SCOs would be removed from the Site. As part of construction, the waterproofing system would also serve as a means to protect future occupants from potential exposure to contaminant vapors from off-site sources that may migrate from off-site via soil gas. Since the entire Site will be built-out and will extend below the water table, there will be no on-site soil vapor.

There could be some exposure to on-site workers and occupants during the remediation process. This would be mitigated through the sequencing of remedial activities and implementation of a Construction Health and Safety Plan (CHASP), including a Community Air

Monitoring Plan (CAMP). The construction workers would follow procedures of an approved CHASP to address measures to be implemented if an underground storage tank or other unexpected condition is discovered. Specialized workers with 40-hour HAZWOPER training would be utilized if such conditions are encountered.

## **3.2 Balancing Criteria**

### **3.2.1 Compliance with Standards, Criteria and Guidance (SCGs)**

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

The Track 1 alternative would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through excavation and removal of all soil/fill with contaminant concentrations above Unrestricted Use SCOs. As part of development, a building slab would be placed on all land surfaces and a waterproofing system would be installed. While not required for a Track 1 cleanup, the waterproofing system would serve as a vapor barrier to prevent any potential future intrusion from off-site soil vapors. This alternative would be consistent with the RAOs and provide overall protection of public health and the environment from on-site derived contamination in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater;
- Eliminating potential future exposures to off-site soil vapors, and
- Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), that comply with the applicable SCGs shall be implemented during all on-site soil disturbance activities under this RAWP. Focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

### **3.2.2 Short-Term Effectiveness and Impacts**

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The remedial alternative would provide short-term effectiveness with the removal of all soil/fill above Track 1 Unrestricted Use SCOs. Track 1 Alternative would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

Remedial alternative would employ appropriate measures to prevent short term impacts, including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-site soil disturbance activities and would minimize the release of contaminants into the environment. Remedial alternative provide short term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Construction Health and Safety Plan (CHASP) will be protected from on-site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

### **3.2.3 Long-Term Effectiveness and Permanence**

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of

containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

The remedial plan would result in removal of soil contamination exceeding the SCOs providing the highest level, most effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which will eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination will also be eliminated as part of the remedy.

#### **3.2.4 Reduction of Toxicity, Mobility, or Volume of Contaminated Material**

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

The Track 1 alternative would provide maximum reduction of toxicity, mobility, and volume of contaminated material on-site by excavation and removal of all soils that exceed the Track 1 unrestricted use SCOs.

#### **3.2.5 Implementability**

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The proposed remedial action is feasible and implementable and uses reliable methods and standard construction technologies. Standard construction equipment utilized for the overall earthwork would be used. OSHA trained personnel will complete all activities that include excavation and handling of petroleum-contaminated or other soil with contamination beyond that associated with typical historical fill material. No special permits other than earthwork permits and a NYCDEP dewatering permit are anticipated for completion of the site redevelopment scope of work during the implementation of the remedy.

### **3.2.6 Cost Effectiveness**

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Historic fill at the Site was found during the Phase II to only extend to a depth of approximately one foot below grade, and the new development requires excavation of the entire Site to a depth of 47-50 feet. The remedial plan conjoins the remedial action with development construction of the building foundation and subgrade parking structures. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soils during the redevelopment of the Site. The costs for the remedial action are reasonable and consistent with the scale of the proposed development.

The remedial alternative satisfies the threshold balancing criterion and other criterion listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduce both mobility and toxicity.

### **3.2.7 Community Acceptance**

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial permitting associated with

the proposed site development, no adverse community opinion is anticipated for either alternative. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan. A Citizen Participation Plan for the project is provided in Appendix 3.

### **3.2.8 Land Use**

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The Track 1 remedial alternative is appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and mixed-use commercial/residential properties and the proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the property achieved by the cleanup alternative is also consistent with the City's goals for cleanup of contaminated land and reintroducing such properties to productive use and is protective of natural resources and cultural resources. This RAWP will undergo public comment under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

### **3.2.9 Sustainability of the Remedial Action**

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

The remedial plan would use renewable and energy efficient building materials, and energy efficient equipment. Clean native soil excavated for development would qualify for management under the NYC Clean Soil Bank. A Sustainability Statement to be implemented during the remediation is provided in Appendix 4.

## **4.0 REMEDIAL ACTION**

### **4.1 Summary of Preferred Remedial Action**

The preferred remedial action is a Track 1 Cleanup. The remedial plan achieves protection of public health and the environment for the intended use of the property. The remedial plan will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The remedial plan is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The remedial plan is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
4. Implementation of the NYC OER-approved supplemental Remedial Investigation Work Plan dated November 2013.
5. Preparation and submission of Remedial Investigation Report (RIR) to NYC OER documenting the results of additional soil, soil vapor and groundwater specified in the Remedial Investigation Work Plan (RIWP). Updating of this Remedial Action Work Plan (RAWP), if required based upon the results of RIR.
6. Establishment of Unrestricted Use Track 1 Soil Cleanup Objectives (SCOs).
7. Excavation and removal of soil/fill exceeding Unrestricted Use SCOs. For development purposes, the Site will be excavated to an approximate depth of 47-50 feet throughout the property.

8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Transportation and off-site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-site.
10. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if encountered) in compliance with applicable local, State and Federal laws and regulations.
11. Collection and analysis of three end-point soil samples from the base of the excavation to determine the performance of the remedy with respect to attainment of SCOs.
12. As part of construction, installation and maintenance of an engineered composite cover consisting of the 12-inch concrete building slab and four levels of ventilated subgrade automotive parking.
13. As part of construction, installation of a waterproofing system beneath the building slab and along outside foundation sidewalls below grade. The water barrier will consist of Grace Preprufe 160R along the foundation walls and Grace Preprufe 300R below the lowest level horizontal slab. While not required for a Track 1 cleanup, the waterproofing system would also serve as a vapor barrier to protect against intrusion of soil gas from off-site sources.
14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
15. Implementation of stormwater pollution prevention measures in compliance with applicable laws and regulations.

16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
17. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and, if Track 1 SCOs are not achieved, describes all Engineering and Institutional Controls to be implemented at the Site.

#### **4.2 Soil Cleanup Objectives and Soil/Fill management**

Track 1 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are the NYSDEC Part 375 SCOs for Unrestricted Use. As a contingency, if Track 1 SCOs cannot be achieved, the alternative would consist of the NYSDEC Part 375 SCOs for Restricted Residential Use. Soil and materials management on-site and off-site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 5.

Any discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

##### **4.2.1 Estimated Soil/Fill Removal Quantities**

The total quantity of soil/fill expected to be excavated and disposed off-Site is 178,000 tons. The proposed disposal locations for Site-derived contaminated materials are listed in Table 1. Final and/or additional disposal locations established at a later date will be reported promptly to the OER Project Manager. Examples of a non-hazardous and hazardous waste manifests are provided in Appendix 6.

**Table 1**  
**Proposed Soil Disposal Locations**

<b>Disposal Facility</b>	<b>Waste Type</b>	<b>Estimated Quantities</b>
P Park, Prospect, NJ	Historical fill and Native Soil	Est. 178,000 tons
Malanka, Secaucus, NJ	Historical fill and Native Soil	(As necessary)
NYC Clean Soil Bank	Native Soil	(If acceptable – Soil must Meet Track 2 Residential SCOs)
Clean Earth, Carteret, NJ	Contaminated Fill and/or Petroleum-contaminated soil (if any)	(As necessary)

**4.2.2 End-Point Sampling**

The full extent of the Site will be excavated to and/or into the groundwater table and the perimeter will consist of shoring and lagging. Removal actions under this plan will be performed in conjunction with remedial end-point sampling. To evaluate attainment of Track 1 - Unrestricted Use SCOs, three soil samples will be collected from the base of the excavation and analyzed for SVOCs and the metals that exceeded Track 1 SCOs in the 2006 Phase II and any additional compounds identified during the Remedial Investigation. In addition, end-point sampling will be performed if hotspots are identified during the remedial excavation. The Hotspot end-point sampling frequency would consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:

- For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
  - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples taken within 24 hours of excavation will be taken from the zero to six-inch interval beneath the excavation floor. Samples taken after 24 hours would be taken at six to twelve inches.
  4. For contaminated soil removal, post-remediation soil samples for laboratory analysis will be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to the above.

Post-remediation sample locations and depths will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples will be biased toward locations and depths of the highest expected contamination.

New York State Environmental Laboratory Accreditation Program (ELAP) certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCOs exceedance are identified) utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;

- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

If either Light Non Aqueous Phase Liquid (LNAPL) and/or Dense Non Aqueous Phase Liquid (DNAPL) are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e., NYSDEC spills hotline) will be performed.

#### **4.2.3 Quality Assurance/Quality Control**

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

One duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. One trip blank will be submitted to the laboratory with each shipment of soil samples.

Samples will be collected in accordance with the following procedures:

- Record sample observations (e.g. evidence of contamination, PID readings, soil classification) in field log book.
- Collect an aliquot of soil or groundwater using a dedicated and disposable plastic sample spoon or sample bailer and place in laboratory-supplied sample jars. One grab sample will be collected for volatile organic compound analysis, if applicable. One composite sample will be collected for all other analyses.
- Seal and label the sample jars as described below and place in a chilled cooler.

### Decontamination Procedures

To avoid contamination and cross-contamination of samples, only dedicated or disposable sampling equipment may be used to collect these samples. All non-disposable equipment involved in field sampling must be decontaminated before being brought to the sampling location, and must be properly decontaminated after use.

### Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric or alpha-alpha code. For stockpiled soil, the alpha prefix will be “SP” and the numbers following the alpha prefix will correspond to excavated stockpiles, beginning with “1, 2, 3...etc.” For example, the first sample collected from the first stockpile will be labeled “SP-1-1” and the first sample collected from the second stockpile will be labeled “SP-2-1.”

For groundwater samples, the alpha prefix will be “GW” and the number following the prefix will correspond to the sample number. For example, the first groundwater sample collected for sample analysis will be labeled “GW-1” and the second sample will be “GW-2.”

### Sample Labeling and Shipping

All sample containers will be labeled with the following information:

- Site identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler’s initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. Soil samples will be shipped to the laboratory at a frequency that will not result in an exceedance of applicable

holding times for sample methods. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment by placing each sample jar in a sealable plastic bag, then wrapping each bag in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a chain-of-custody (COC) seal to ensure that the coolers remain sealed during delivery.

#### Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

#### Documentation

A sample log book will be maintained. The following information, as a minimum will be recorded to the log.

- Sample identification number
- Sample location
- Field observations
- Sample type
- Analyses
- Date/time of collection

- Collector's name
- Sample procedures and equipment utilized
- Date sent to laboratory/name of laboratory
- Copies of site drawings indicating stockpile numbers and locations

#### **4.2.4 Import and Reuse of Soils**

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 5. The current redevelopment plans do not include importing soil to the Site for backfill and cover soil and the on-site soil/fill is not expected to be reused/relocated on-site. The plans include a street level landscaped area situated in planting beds on top of the four level parking garage; as such, it is not considered part of the Site remedy.

### **4.3 Engineering Controls**

The excavation required for the proposed Site development will achieve Track 1 Unrestricted Use SCOs. No Engineering Controls are required to address residual contamination at the Site. However, the following elements will be incorporated into the foundation design as part of the development: composite cover system and waterproofing barrier. If Track 1 is not achieved, these two elements will constitute Engineering Controls that will be employed in the remedial action to prevent direct contact to residual contamination remaining at the Site and address potential vapor intrusion.

#### **4.3.1 Composite Cover System**

As part of new development, the entire property will be covered by an engineered permanent cover system. This cover system will be composed of a 12-inch thick concrete-building slab beneath the area of the proposed building.

The proposed development plans do not include landscaped areas (i.e., areas not covered with pavement or structures). An approximately 26,517-square foot landscaped area is planned for the ground level on top of the subgrade parking structure. Any such fill imported to the Site

would be certified clean fill. Additional details regarding the importation of fill to the Site are included in the Soil Management Plan in Appendix 5.

If Track 1 SCOs are not achieved at the Site, the composite cover system would be a permanent engineering control. The system would be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan would be included in the Site Management Plan and would outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system would be described in the Site Management Plan in the RAR.

#### **4.3.2 Waterproofing (Contingency Vapor Barrier if Track 1 Not Achieved)**

As part of development, migration of soil vapor will be mitigated with a combination of building slab and the water barrier. Based on AKRF's Phase II Investigation, groundwater was encountered at approximately 45-48 feet below grade. Since the bottom of the new building's foundation is to be installed at 47-50 feet below grade, the base of the building will be installed into the water table. Groundwater results do not indicate a source of VOCs in groundwater underlying the property that might pose a potential for soil vapor intrusion or require more rigorous vapor management approaches.

Due to the proximity of the water table, a moisture barrier is to be installed as part of the waterproofing for the proposed new construction. The barrier will consist of Grace Preprufe 160R along the foundation walls and Grace Preprufe 300R below the lowest level horizontal slab. While not required as an engineering control as part of a Track 1 cleanup, the waterproofing will also serve as a vapor barrier that would mitigate potential vapors from off-site properties. The barrier will be installed in accordance with the manufacturer's specifications, including those for sealing penetrations through the foundations. Proof of installation of the barrier will be included in the Professional Engineer (P.E.) certified Remedial Closure Report discussed in Section 4.0. The barrier specifications are provided in Appendix 7. If Track 1 is not achieved, the waterproofing system would be a permanent engineering control for soil vapor at the Site.

#### 4.4 Institutional Controls

Track 1 remedial actions do not require Engineering Controls. If Track 1 SCOs are not achieved, Institutional Controls (IC) would be utilized in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs would be implemented under a site-specific Site Management Plan (SMP) that would be included in the RAR.

Institutional Controls for this remedial action would be:

- The Restrictive Declaration for the property will remain in place. This RAWP and SMP includes a description of all EC's and IC's and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP.
- Submittal of a SMP in the RAR for approval by the NYC OER that provides procedures for appropriate operation, maintenance, inspection and certification of EC's and IC's. SMP will require that the property owner and property owner's successors and assigns would submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited.
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use.
- All future activities on the Site that would disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP.
- The Site would be used for residential use and will not be used for a higher level of use

without prior approval by OER.

#### **4.5 Site Management Plan**

Site Management is not required for Track 1 remedial actions. However, if Track 1 SCOs are not achieved a Site Management Plan (SMP) would be the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The SMP would describe appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The SMP would be submitted as part of the RAR but would be written in a manner that allows its use as an independent document. The SMP would continue until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

Because excavation efforts will remove impacted soil at the Site and achieve Track 1 Unrestricted Use SCOs, an SMP is not anticipated.

#### **4.6 Qualitative Human Health Exposure Assessment**

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

This Qualitative Human Health Exposure Assessment (QHHEA) is prepared based on the investigations reported in the Phase II Subsurface Investigation Report. The sampling data from the RI were evaluated to determine whether there is any health risk by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation. The QHHEA will be updated if warranted based upon supplemental testing provided in the Remedial Investigation Report (RIR).

#### 4.6.1 Known and Potential Sources

Site inspections/investigations (including a Phase I ESA, geotechnical study, and Phase II Site Investigation) have been performed at the Site to identify AOCs. Potential source areas include historical fill. Historic fill material was present in soil directly beneath the asphalt surface, but was generally no more than one foot thick. No indications of contamination (e.g., elevated PID readings, staining or odors) were detected in any of the recovered soil. Groundwater was encountered during the Phase II Investigation at depths of 45 to 48 feet below grade. No sheen or odors were detected in the sampled groundwater.

Based on the results of the Phase II report, the contaminants of concern found are:

##### Soil

- Several metals were identified but did not exceed Restricted Residential SCOs. Only lead exceeded Track 1 Unrestricted Use SCOs; and
- Several SVOCs were detected and none exceeded Track 1 Unrestricted Use SCOs.

##### Groundwater

- VOCs including methyl tert-butyl ether (MTBE) and tetrachloroethene (PCE) exceeded GQS;
- SVOCs including benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene exceeded GQS; and
- Metals including barium, chromium, copper, iron, lead, magnesium, nickel, and sodium exceeded GQS.

##### Soil vapor

Soil vapors were not investigated during Phase II investigation. Soil vapor sampling will be conducted as part of remedial investigation after demolition of existing structures. QHHEA will be updated if required based upon soil vapor results.

#### **4.6.2 Nature, Extent, Fate and Transport of Contaminants**

Low levels of SVOCs and metals are present within the historic fill material throughout the Site. Most of these contaminants are present to a depth of approximately one to two feet below grade with the exception of SVOCs in one deeper soil boring location. Based on the findings of the Phase II investigation and the current Site conditions, these contaminants are not mobile or migrating within or from the Site. The depth of groundwater during the Phase II Investigation was 45-48 feet below grade at the Site. The presence of the VOCs, SVOCs, and metals are likely reflective of regional conditions.

Prior to initiating excavation work at the Site, additional soil, groundwater and soil vapor samples are scheduled to be collected to further assess the nature and extent of the potential contaminants in the groundwater and soil vapor beneath the Site.

#### **4.6.3 Potential Routes of Exposure**

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be ruled out. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill, or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with fill or soil.

These routes of exposure are possible before, during and after the remedial action if proper precautions are not taken.

#### **4.6.4 Existence of Human Health Exposure**

Current Conditions: The potential for exposure to surficial historic fill does not exist under current conditions because Site is covered with asphalt and the soil is not exposed. Groundwater is marginally contaminated but is not exposed at the Site, and because the Site is served by the public water supply and groundwater use for potable supply is prohibited, groundwater is not used at the Site and there is no potential for exposure.

Construction/ Remediation Activities: Once redevelopment activities begin, construction workers will come into direct contact with surface and subsurface soils and groundwater, as a result of on-Site construction and excavation activities. The work performed at the Site will include excavation of soil/fill material, potential dewatering, and general construction activities and will affect the on-site construction/remediation workers and the off-site local population. The construction and remediation work at the Site could expose the on-site workers to the contaminants in a variety of ways, including direct contact with the soil and possibly groundwater (during dewatering) and inhalation/ingestion of soil (by means of fugitive dust), groundwater, and soil vapor. These exposures will be limited to short durations through the intrusive work. The construction and remediation work at the Site may expose the off-site community to the contaminants in a variety of ways, including inhalation of soil (by means of fugitive dust) and soil vapors. During construction, on-site and off-site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan, dust controls, and through the implementation of the Community Air-Monitoring Program and a Construction Health and Safety Plan.

Proposed Future Conditions: Under future remediated conditions, all soils in excess of Track 1 SCOs will be removed. The Site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and the waterproofing system will be installed. While not required for a Track 1 cleanup, the waterproofing would also serve as a vapor barrier to prevent future exposure from potential off-site soil vapors. The Site is served by a public water supply, and groundwater is not used at the Site for potable supply. There are no plausible

off-Site pathways for ingestion, inhalation, or dermal exposure to contaminants derived from the Site under future conditions.

#### **4.6.5 Receptor Populations**

On-Site Receptors – The Site is currently capped and access to Site is restricted. On-site receptors are limited to trespassers and site representatives and visitors granted access to the property. During redevelopment of the Site, the on-site potential receptors will include construction workers, site representatives, and visitors. Once the Site is redeveloped, the on-site potential sensitive receptors will include adult and child building residents, workers and visitors.

Off-site receptors - Potential off-site receptors within a 0.25-mile radius of the Site include adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists– existing and future
5. Schools– existing and future

#### **4.6.6 Overall Human Health Exposure Assessment**

Complete on-site exposure pathways appear to be present only during the current unremediated phase. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a residential structure, site-wide impervious surface cover cap, and a subsurface waterproofing system for the building. In the event that a Track 1 cleanup cannot be achieved, the waterproofing system would be an engineering control and serve as a vapor barrier to prevent potential vapor intrusion from off-site sources. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source.

Exposure of both on-site workers and the off-site local population to site contaminated media (soil and soil vapor) has the greatest potential during the remedial and construction work. In order to mitigate possible exposure levels, a Construction Health and Safety Plan (CHASP) will be implemented during construction and remedial work for the safety of the on-site workers and off-site local population. Other measures include conducting a community air monitoring programs (CAMP) for dust and VOCs to track on-site and off-site conditions, requiring personal protective equipment, provisions for upgrading the level of personal protective equipment when needed, and applying dust and vapor suppression measures, trucks will be inspected and washed prior to departure from the property, and stormwater controls will be employed.

After the remedial action is complete, there will be no remaining exposure pathways. The proposed development will achieve Track 1 SCOs and requires excavation to a depth of up to 50 feet over the entire Site for development purposes. Currently, the soil and fill does not exceed Track 2 Restricted Residential SCOs and do not pose an exposure threat. Groundwater use for potable purposes is prohibited in this area of NYC and ingestion is not a risk. Currently, groundwater contains low to moderate levels of VOCs, SVOCs, and select metals and does not pose an exposure threat. As part of development, a waterproofing system will be installed at the Site. While not required as part of a Track 1 cleanup, the waterproofing system will address potential future off-site sources of soil vapor. Since the bottom of the foundation for the sub-grade parking structure is to be installed approximately 47-50 feet below grade, the base of the building will be installed at and/or into the water table. In addition, the Site will contain a ventilated four level sub-grade automotive parking structure. Groundwater results do not indicate a source of VOCs in groundwater underlying the property that might pose a potential for soil vapor intrusion or require more rigorous vapor management approaches.

## **5.0 REMEDIAL ACTION MANAGEMENT**

### **5.1 Project Organization and Oversight**

Principal personnel who will participate in the remedial action include:

Marc Godick            AKRF Project Director

Stephen Malinowski   AKRF Project Manager

Robert Andrews        AKRF Field Team Leader and Site Safety Officer

The Professional Engineer (PE) for this project will be Michelle Lapin (New York State Professional Engineer #073934-1).

### **5.2 Site Security**

Site access will be controlled by construction fencing with gated entrances to the fenced Site. Barriers will be installed as needed to delineate and restrict access to the work areas. If there are any work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

### **5.3 Work Hours**

The hours for operation of remedial construction will conform to the New York City Department of Buildings (DOB) construction code requirements or according to specific variances issued by DOB.

### **5.4 Construction Health and Safety Plan**

The Health and Safety Plan is included in Appendix 8. The Site Safety Coordinator will be Robert Andrews. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

## **5.5 Community Air Monitoring Plan**

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations

include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

#### **5.5.1 VOC Monitoring, Response Levels, and Actions**

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

#### **5.5.2 Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

#### **5.6 Agency Approvals**

All permits or government approvals required for remedial construction have been or will

be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

## **5.7 Site Preparation**

### **5.7.1 Pre-Construction Meeting**

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

### **5.7.2 Mobilization**

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

### **5.7.3 Utility Marker Layouts, Easement Layouts**

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the mark-out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-site and off-site structures will be

maintained during all invasive, excavation or other remedial activity performed under the RAWP.

#### **5.7.4 Dewatering**

Based on the proposed excavation depth, dewatering is anticipated to become necessary during project construction. Regulatory protocols may require pretreatment of water pumped from the Site before its discharge into the sewer system. Prior to initiating any dewatering activities, a water sample would be analyzed to ensure it meets the New York City Department of Environmental Protection (NYCDEP) criteria for effluent to municipal sewers as part of the application process for the NYCDEP Bureau of Wastewater Treatment (BWT) Wastewater Quality Control Permit. Any contaminated water generated by construction dewatering would be treated on-site, if necessary, to meet discharge limitations. Following on-site treatment, the water would be disposed of in the City sewer with the appropriate permit. The dewatering permit application would be submitted prior to any excavation activities.

#### **5.7.5 Equipment and Material Staging**

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Staging and storage of equipment and materials will be contained within the secured Site. By the nature of the work involved in this project, equipment and materials will be moved to different areas within the secured Site as work progresses.

#### **5.7.6 Stabilized Construction Entrance**

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

#### **5.7.7 Truck Inspection Station**

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be

examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

#### **5.7.8 Extreme Storm Preparedness and Response Contingency Plan**

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

##### **Storm Preparedness**

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary; clean and reposition silt fences/haybales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

##### **Storm Response**

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm

event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Contaminated stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off-site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Contaminated off-site areas may require characterization based on Site conditions, at the discretion of OER. If on-site petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

### **Storm Response Reporting**

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website ([www.nyc.gov/oer](http://www.nyc.gov/oer)) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage

and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of on-site or off-site exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; and schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

### **5.8 Traffic Control**

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the Site is to exit the Site and head north on Union Street, turn left (west) on Northern Boulevard, and proceed four blocks to an on-ramp to the Van Wyck Expressway.

### **5.9 Demobilization**

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field

activities. Investigation equipment and large equipment such as soil excavators will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

## **5.10 Reporting and Record Keeping**

### **5.10.1 Daily Reports**

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any; and
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

An alpha-numeric site map will be used to identify locations described in reports submitted to OER and is shown in Figure 4.

### **5.10.2 Record Keeping and Photo-Documentation**

Job-site record keeping for all remedial work will be performed. These records will be maintained on-site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e., jpeg files).

### **5.11 Complaint Management**

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

### **5.12 Deviations from the Remedial Action Work Plan**

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

## **6.0 REMEDIAL ACTION REPORT**

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP.
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy.
- Site Management Plan (if Track 1 is not achieved).
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents.
- Tabular summary of all end point sampling results (if necessary), and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action.
- Test results or other evidence demonstrating that remedial systems are functioning properly.
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas.
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Reports and supporting material will be submitted in digital form.

## **6.1 Remedial Action Report Certification**

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

*I, Michelle Lapin, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Flushing Commons Phase 1A Project Site NYC VCP number 14CVCP191Q and OER project number 14RHAN223Q.*

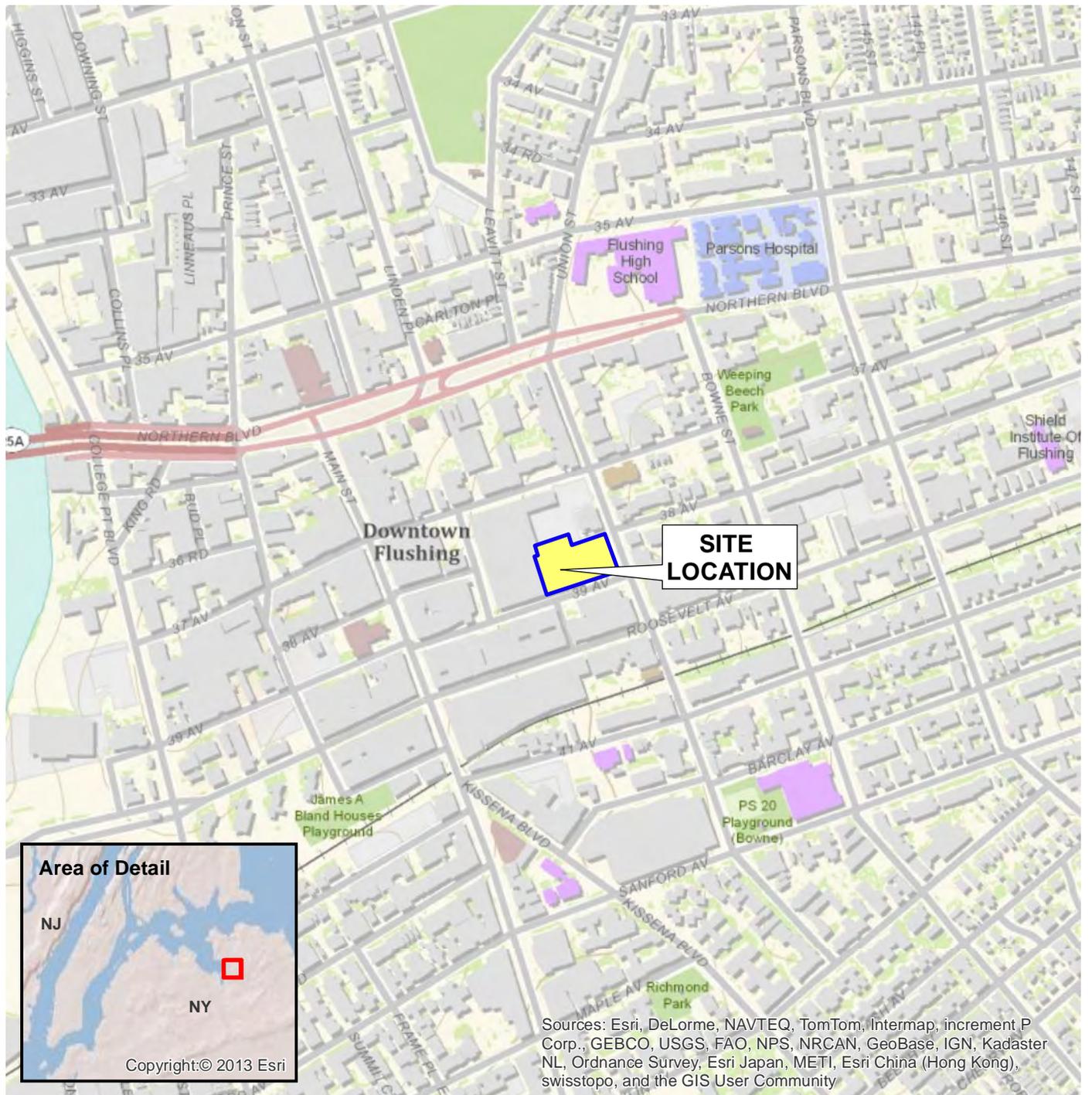
*I certify that the OER-approved Remedial Action Work Plan dated **month day year** and Stipulations in a letter dated **month day, year; if any** were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.*

## 7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 19 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	1	1
Mobilization of Security	3	2
Additional Subsurface Investigation	6	1
Supplement RI Report and Potential RAWP update	7	4
Soil Waste Classification Testing	12	3
Mobilization of Heavy Equipment Security	16	1
Remedial Excavation	17	52
Demobilization	TBD	2
Remedial Action Report for Track 1 Cleanup	76	TBD
Submit Remedial Action Report	TBD	TBD

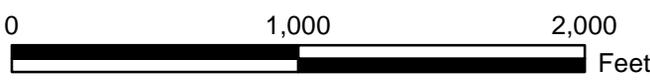
## **FIGURES**



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

**SOURCE**  
 USGS 7.5 Minute Topographic Map  
 FLUSHING Quad 2011

**Legend**  
 Parcel 1A Site Location



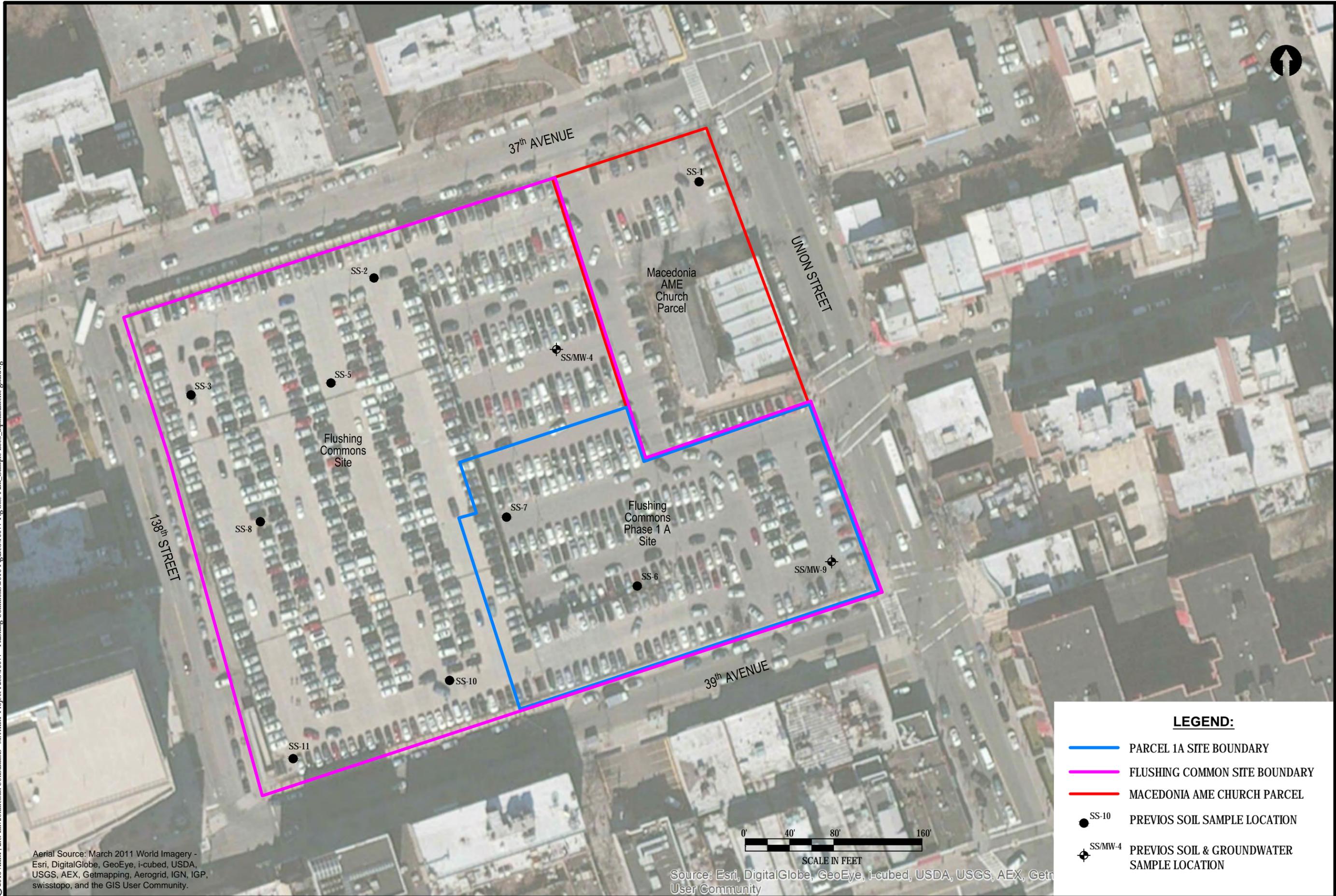
**Flushing Commons Parcel 1A**  
 Queens, New York

**SITE LOCATION MAP**

**AKRF**  
 Environmental Consultants  
 440 Park Avenue South, New York, N.Y. 10016

DATE <b>10/11/2013</b>
PROJECT No. <b>10677</b>
FIGURE <b>1</b>

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Environmental Consultants  
440 Park Avenue South, New York, NY 10016

**FLUSHING COMMONS PARCEL 1A**

Queens, New York

**SITE PLAN**

DATE  
10.24.2013

PROJECT NO.  
10677

SCALE  
as shown

FIGURE  
2

**LEGEND:**

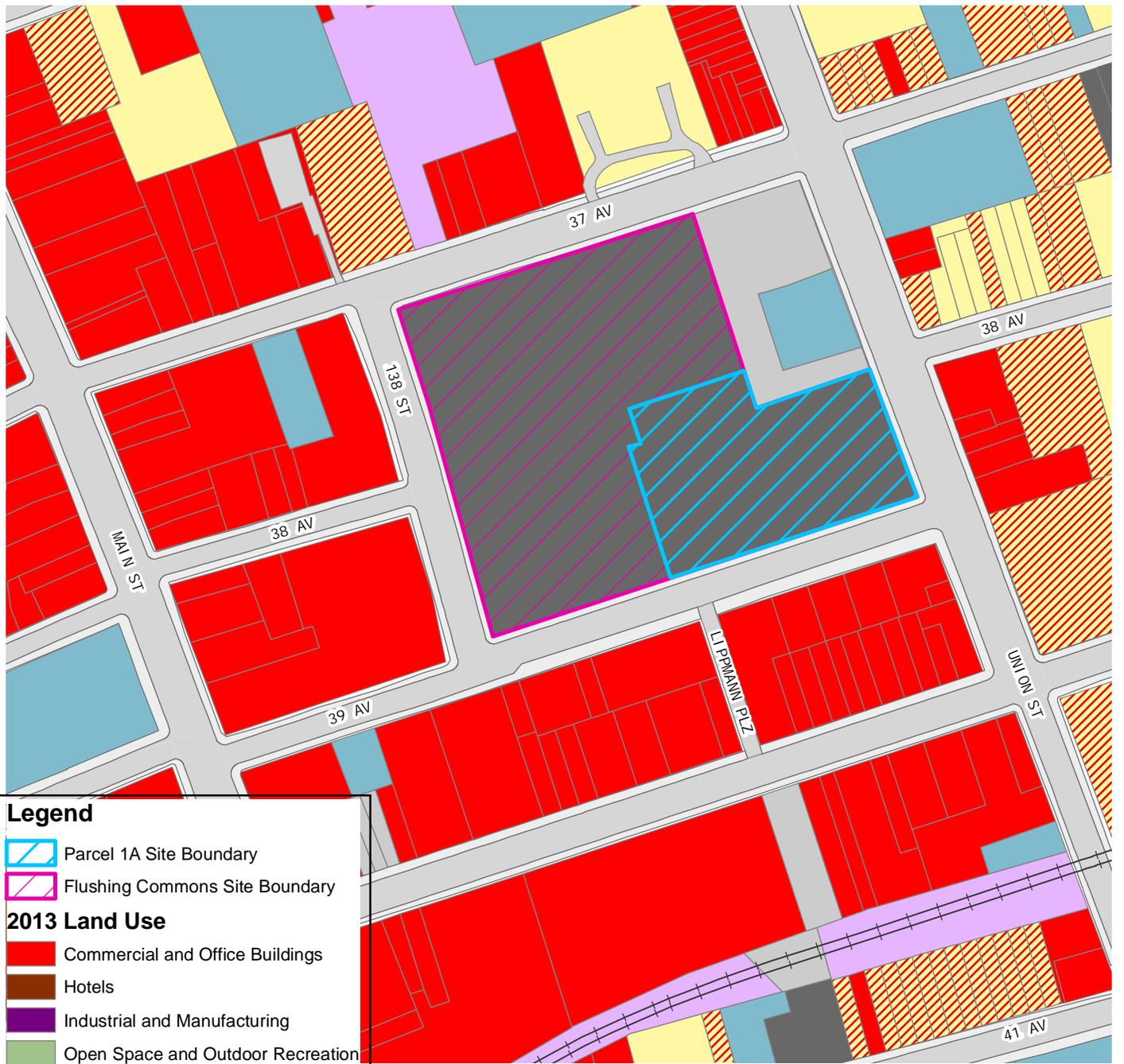
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-  FLUSHING COMMON SITE BOUNDARY
-  MACEDONIA AME CHURCH PARCEL
-  SS-10 PREVIOUS SOIL SAMPLE LOCATION
-  SS/MW-4 PREVIOUS SOIL & GROUNDWATER SAMPLE LOCATION



SCALE IN FEET

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Aerial Source: March 2011 World Imagery - Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.



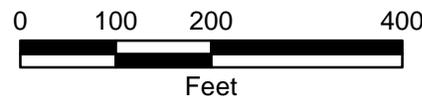
**Legend**

- Parcel 1A Site Boundary
- Flushing Commons Site Boundary

**2013 Land Use**

- Commercial and Office Buildings
- Hotels
- Industrial and Manufacturing
- Open Space and Outdoor Recreation
- Parking Facilities
- Public Facilities and Institutions
- Residential
- Residential with Commercial Below
- Transportation and Utility
- Vacant Land
- Vacant Building
- Under Construction

Source: NYCDP (NYC Dept. of City Planning) GIS database



**Flushing Commons Parcel 1A**  
Queens, New York



DATE	10/17/2013
PROJECT No.	10677
FIGURE	3

**SITE PLAN AND  
SURROUNDING LAND USE**

Environmental Consultants  
440 Park Avenue South, New York, N.Y. 10016

## **APPENDIX 1**

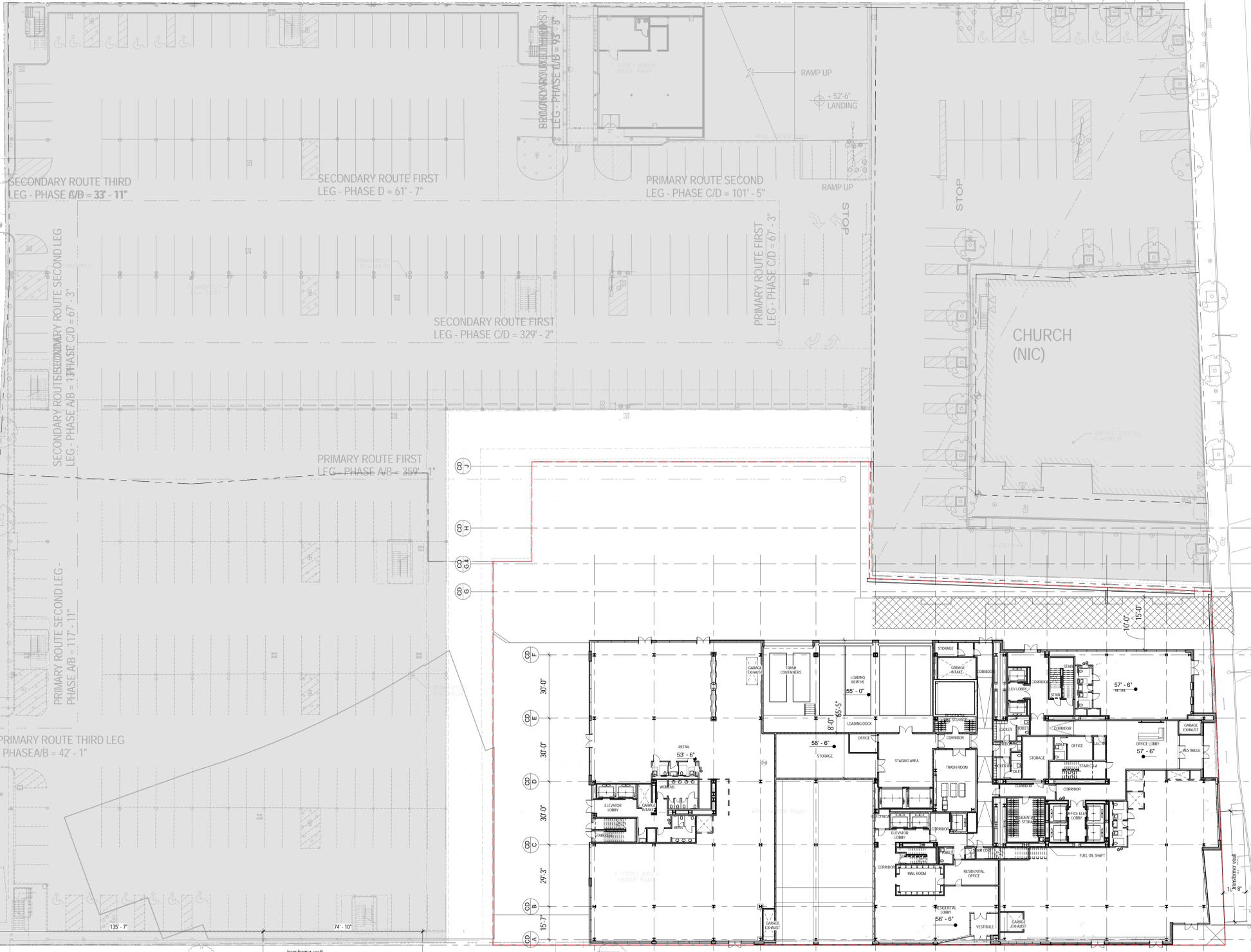
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37TH AVENUE (68' WIDE)

138TH STREET (WIDTH VARIES)  
138TH STREET

UNION STREET (60' WIDE)  
UNION STREET

39TH AVENUE (58' WIDE)  
39TH STREET



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06-03-2013	100% DESIGN DEVELOPMENT
04-10-2013	75% DD
NO. DATE	ISSUE



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**Landscape Architect:**  
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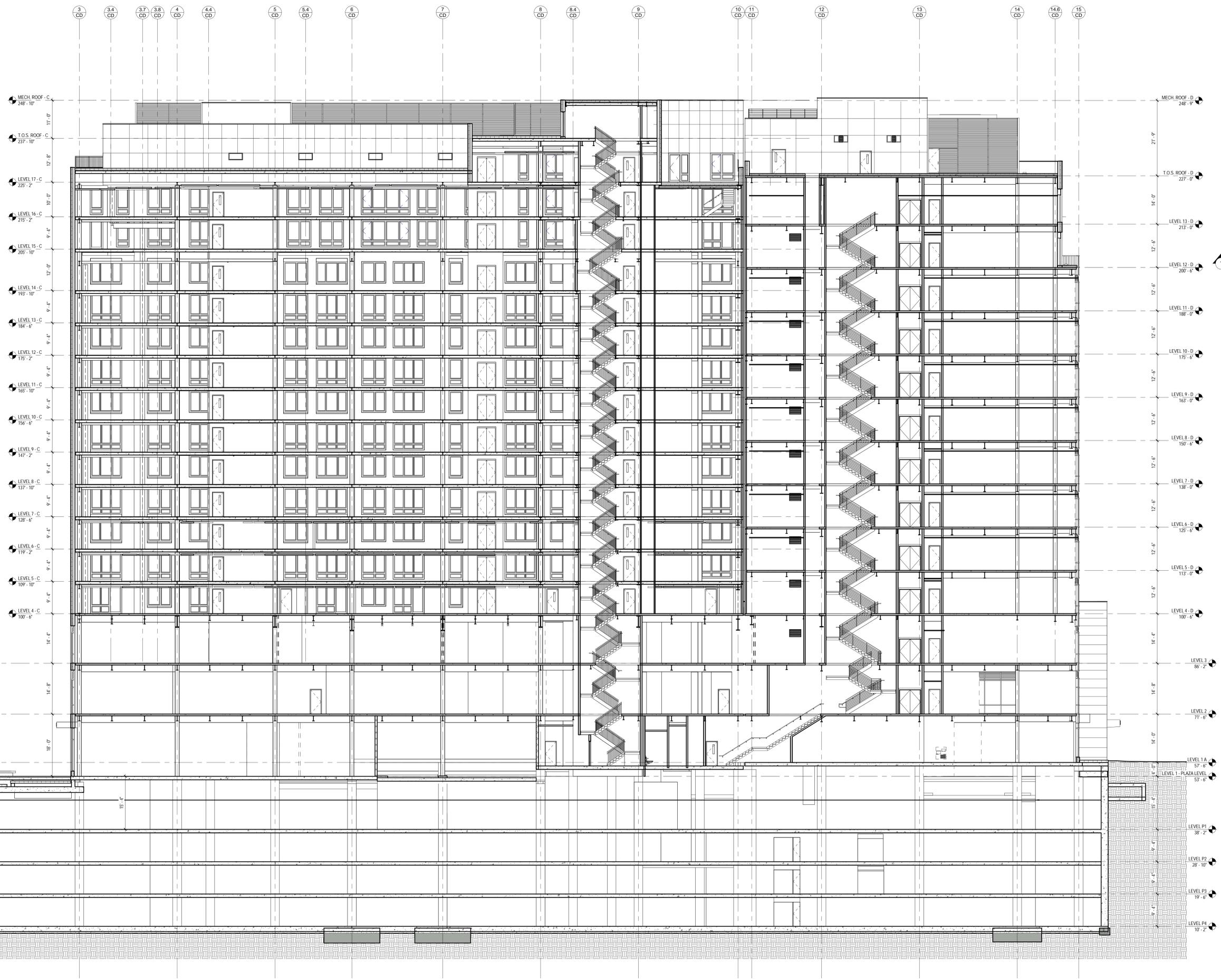
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LOT 40  
**C&D**

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**PROJECT No:** 48660.00  
**DOB No:**

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ARCHITECTURAL  
SITE PLAN

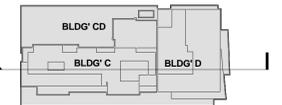
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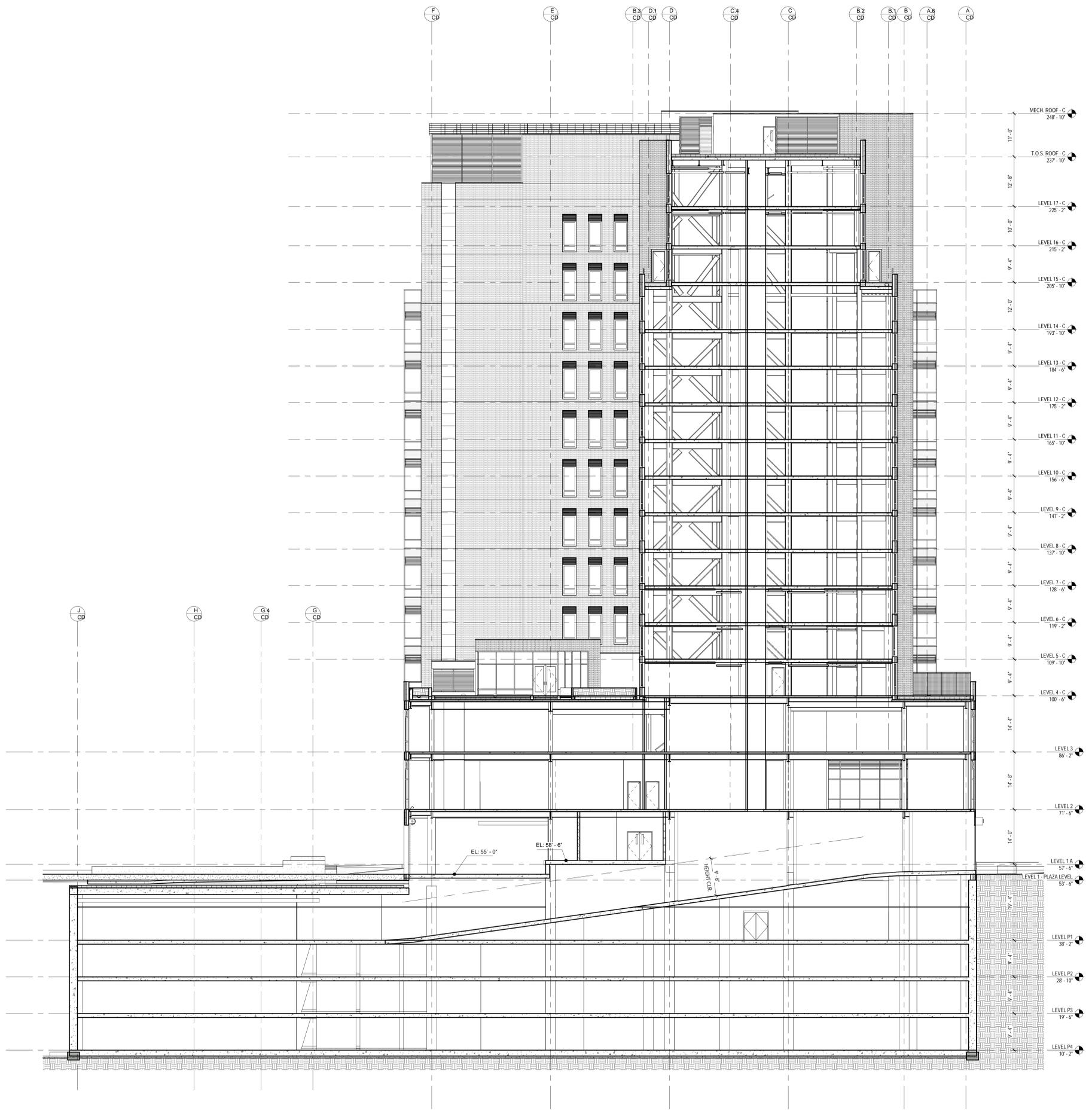
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**PROJECT TITLE:**  
**FLUSHING COMMONS**  
**LOT 40**  
**C&D**  
 38-18 Union Street  
 Flushing, NY 11354  
**PROJECT No:** 48660.00  
**DOB No:**  
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**BUILDING SECTION**  
**E-W 1**

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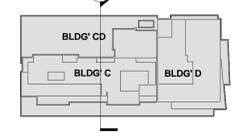
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1 BUILDING SECTION N/S 1  
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04-10-2013	75% DD	



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FLUSHING COMMONS  
LOT 40  
**C&D**  
38-18 Union Street  
Flushing, NY 11354

**PROJECT No:** 48660.00  
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## **APPENDIX 2**

# **REMEDIAL INVESTIGATION WORK PLAN**

# REMEDIAL INVESTIGATION WORK PLAN

---

## Flushing Commons Phase 1A

38-18 Union Street

Flushing, NY 11354

Block 4978, Lot 25

OER Project Number: 14RHAN223Q

AKRF Project Number: 10677

CEQR Number 06DME010Q

NYCDEP File 06DEPTECH098Q

### **Prepared for:**

**Flushing Commons, LLC**

% Rockefeller Group Development Corporation

1221 Avenue of Americas

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### **Prepared by:**



**AKRF, Inc.**

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**NOVEMBER 2013**

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- Appendix A Health and Safety Plan  
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## **1.0 INTRODUCTION**

The Flushing Commons project site consists of a 4.9 acre New York City Department of Transportation parking facility occupying the majority of the city-block bounded by 37<sup>th</sup> Avenue, Union Street, 39<sup>th</sup> Avenue, and 138<sup>th</sup> Street in the Flushing section of Queens. Flushing Commons was formerly the subject of environmental investigation and review by the New York State Department of Environmental Protection (NYCDEP); CEQR No. 06DME010Q and NYCDEP file 06DEPTECH098Q. This following scope of work has been developed in response to AKRF's meeting with the Mayor's Office of Environmental Remediation (OER) on October 7, 2013. This project has been assigned project number 14RHAN223Q by OER. The goal of the Phase II investigation is to ascertain additional soil, soil vapor, and groundwater data specific to an approximately 67,600-square foot portion of the Flushing Commons site scheduled for the first phase of the larger redevelopment project. This area of the Flushing commons project site (the Site) is referred to as Phase 1A and is the subject of this work plan. The data is intended to supplement previous data collected on the larger Flushing Commons site, which is discussed further in Section 2.2. The Health and Safety Plan (HASP) included in Appendix A contains measures to protect on-site personnel and the public from environmental hazards during the implementation of this Plan in accordance with ASTM and OSHA guidelines.

### **1.1 Site Location and Current Use**

The Flushing Commons site is bounded by 37<sup>th</sup> Avenue, Union Street, 39<sup>th</sup> Avenue, and 138<sup>th</sup> Street in the Flushing section of Queens, NY and is identified as Block number 4978, Lot 25. Currently, the majority of the Flushing Commons site is utilized for automotive parking except for the northeast portion of the block, which is occupied by the Macedonian African Methodist Episcopal Church building and adjacent paved parcel. The Flushing Commons site is scheduled to undergo redevelopment in phases; this Phase II Investigation Work Plan has been prepared for the first stage of the development process or Phase 1A. Phase 1A consists of an approximate 67,600-square foot portion of the Flushing Commons site situated on the corner nearest 39<sup>th</sup> Avenue and Union Street (the Site). The location of the Flushing Commons site is provided as Figure 1. A Site Plan depicting the Phase 1A portion of the site and proposed sample locations is provided as Figure 2.

The surface topography of the project site is generally level, sloping gently down to the west. Based on the U.S. Geological Survey Flushing, New York topographic map, the property lies at an elevation of approximately 50 feet above the National Geodetic Vertical Datum of 1929 (an approximation of mean sea level). Based on a Geotechnical Engineering Study by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. dated June 10, 2013, the approximate depth to groundwater is expected to be between 40 and 50 feet below grade. Groundwater was observed between 45-48 feet below grade during a Phase II Subsurface Investigation conducted by AKRF, Inc. in 2006.

### **1.2 Proposed Development Plan**

The proposed development plan for the Flushing Commons site comprises a mix of uses, including residential, retail, restaurant, common space, a large non-profit health club (e.g., YMCA), and medical offices. The proposed redevelopment for the Site as part of Phase 1A consists of the construction of two mixed-use buildings (Buildings C and D) with a footprint area at grade of 41,153 square feet and four levels of subgrade parking containing 1,007 parking spots. The cellar area is 67,670 square feet. The first floors of buildings C and D include loading areas, an office lobby, residential lobby and an open space plaza with an approximately 26,517-square foot landscape area on the ground floor above the parking garage. The second floor of each building includes retail establishments and the third floor contains office space. Floors 4 through

17 in building C are designed for residential use and the 4<sup>th</sup> through 13<sup>th</sup> floors in building D are designed for commercial use. A residential amenity roof is planned for the 4<sup>th</sup> floor. The total gross building square footage is 696,432.

The construction plan includes a full build-out of the Site with excavation to approximately 50 feet below grade to construct the below-grade parking structure. Partial demolition of the existing steel structure garage with parking on the roof and access ramp will be necessary to facilitate the excavation. The excavation is planned to extend up to 50 feet below grade for the building's spread footings and terminate at and/or in the water table. It is estimated that approximately 178,000 tons of soil will require excavation and off-site disposal during the foundation excavation. Architectural drawings of the proposed redevelopment for Phase 1A are included in Appendix B. The zoning designation is C4-4.

### 1.3 Site History

According to a Phase I Environmental Site Assessment (ESA) performed by AKRF in 2005, historical Sanborn maps indicated that the project site was part of a residential neighborhood on the earliest map from 1886. At some time between 1886 and 1897, most of the vacant land in the area became residential. By 1917, the subject property had begun a transformation from residential to commercial use; a trend that continued through 1964-65 when the current parking facility was constructed. The surrounding area has been a commercial/residential community since the earliest map from 1886.

### 1.4 Description of Surrounding Properties

The Flushing Commons site is bounded to the north by 37<sup>th</sup> Avenue, to the east by Union Street, to the south by 39<sup>th</sup> Avenue and to the west by 138<sup>th</sup> Street. The Macedonian African Methodist Episcopal (A.M.E.) Church is north-adjacent to the Phase 1A Site and is the only other property on the block not part of the parking facility. To the north, across 37<sup>th</sup> Avenue, there is an 11-story residential complex. The New York Police Department 109<sup>th</sup> Precinct is east of the subject property, across Union Street. The remainder of the properties surrounding the Flushing Commons site are primarily residential and commercial/retail properties.

## 2.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The prior environmental reports summarized below were prepared for the entire Flushing Commons site, which includes the Phase 1A portion, which is the subject of this report. Copies of these reports have been previously submitted to OER.

### 2.1 Phase I Environmental Site Assessments

Phase I Environmental Site Assessment for Block 4978, Lot 25, Flushing, NY, Lawler, Matusky & Skelly Engineers, LLP, October 2001

Lawler, Matusky & Skelly Engineers, LLP, completed a Phase I Environmental Site Assessment in October 2001. The investigation included a site inspection, historical research, and a regulatory review. A tank test failure in close proximity and hydrologically upgradient from the project site was identified as a Recognized Environmental Condition (REC) for the Site. Historical Sanborn maps from 1892 and 1917 indicated the presence of a graveyard on a portion of the property. Although the graveyard was noted to not present a REC, it was presented as an "issue to be considered."

Phase I Environmental Site Assessment for Flushing Commons, Flushing NY, AKRF, Inc., October 2005

AKRF completed a Phase I Environmental Site Assessment for the Flushing Commons property in October, 2005. The assessment included a site inspection, historical research, and a regulatory review. Recognized environmental conditions identified by the Phase I ESA included:

- The unknown origin of onsite urban fill materials was also identified as a potential environmental concern;
- Based on the age of on-site structures, potential asbestos-containing materials (ACMs) and lead-based paint may be present at the site;
- Fluorescent lights and lighting fixtures observed during the site inspection may include polychlorinated biphenyl (PCB) and/or mercury-containing components (including capacitors and potting compounds); and
- The off-site use of chemicals or hazardous substances at current or former facilities in the surrounding properties may have affected local groundwater quality.

2.2 **Phase II Subsurface Investigation**

Subsurface (Phase II) Investigation for Flushing Commons, Flushing NY, AKRF, Inc., May 2006

AKRF completed a Phase II Subsurface Investigation for the overall Flushing Commons property in 2006, which included the Phase 1A site. The investigation included the advancement of 11 soil borings and the collection of 22 soil samples and 2 groundwater samples for laboratory analysis. Historic fill material was present in soil directly beneath the asphalt surface, but was generally no more than one foot thick.

Significant findings were as follows:

- No volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) or pesticides were detected in any of the soil samples analyzed. Although semivolatile organic compounds (SVOCs) were detected in seven soil samples across the overall Flushing Commons site and only one location of the Phase 1A Site, all were at concentrations below the New York State Department of Environmental Conservation (NYSDEC) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs). Metals were detected in most of the soil samples from the overall Flushing Commons site, but generally at concentrations either below the Unrestricted Use SCOs or within normal background levels encountered in eastern U.S. and New York State soils. Lead [maximum of 300 milligrams per kilogram (mg/Kg)] and nickel (maximum of 36 mg/Kg) were each found in three of the samples above the Unrestricted Use SCOs but below the Restricted Residential SCOs. The maximum lead concentration of 300 mg/Kg was reported in sample SS-7 (0.5'-2') collected on the Phase 1A Site.
- Groundwater was encountered at a depth of approximately 45 to 48 feet below surface grade. Two groundwater samples were collected from temporary wells MW-4 and MW-9 for laboratory analysis. Well MW-4 was located north of the Site and MW-9 was located near the southwestern corner of the Site, by the corner of 39<sup>th</sup> Street and Union Street. Groundwater sample analytical results were compared to the NYSDEC Class GA Ambient Water Quality Standards provided in the Technical and Operational Guidance Series (TOGS) 1.1.1. (Drinking Water Standards), although groundwater in Flushing is not used as a potable source.
- Methyl tert-butyl ether (MTBE), a common additive to gasoline, was detected in MW-4, at a concentration of 15 parts per billion (ppb), exceeding the Class GA guideline value of 10 ppb.

Chlorinated solvents were detected in both groundwater samples, but only tetrachloroethene (PCE) in the sample from MW-4, detected at a concentration of 12 ppb, exceeded the 5 ppb Class GA standard.

- SVOCs were detected in both groundwater samples, but only exceeded the Class GA criteria in sample MW-4. The Class GA standard for all the three SVOCs detected in MW-4, including benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene, is 0.002 ppb. These compounds were detected in MW-4 at concentrations of 0.24 ppb, 0.23 ppb, and 0.20 ppb respectively. Acenaphthene was detected in the sample from MW-9 at a concentration of 0.23 ppb, well below the Class GA standard of 20 ppb. PCBs and pesticides were not detected above method detection limits in either sample. Total and dissolved metals were detected in both samples, in some cases above Class GA groundwater standards. Dissolved metals exceeding the Class GA groundwater standards included barium, chromium, copper, iron, lead, magnesium, nickel, and sodium. The detected compounds were attributable to entrained sediment and/or regional groundwater quality and not to an on-site release.

### **3.0 REMEDIAL INVESTIGATION SCOPE OF WORK**

An investigation of soil, soil vapor, and groundwater will be performed to properly characterize the site for potential environmental impacts from historic on-site/off-site uses, operations, etc. The proposed sampling event will address both RECs and historic fill, as well as to provide general horizontal/vertical characterization across the site for development purposes. The sampling procedures of this investigation will be performed in accordance with the NYSDEC Technical Guidance for Site Investigation and Remediation DER-10. Field work will be conducted under the site-specific HASP provided in Appendix A. Emergency contact information is provided in Section 3.2 of the HASP. The proposed sampling locations are shown on Figure 2.

The following scope of work will be completed at the site:

1. Geophysical Survey;
2. Advancement of ten borings with the collection of two soil samples from each boring;
3. Collection of groundwater samples from up to four borings; and
4. Installation of soil probes for the collection of three soil vapor samples and one ambient air sample.

#### **3.1 Geophysical Survey**

A geophysical survey, including ground-penetrating radar (GPR) and magnetometry, will be conducted over the Site surface to investigate the potential presence of any underground storage tanks (USTs). GPR uses electromagnetic wave propagation and scattering to image and identify changes in electrical and magnetic properties in the ground. Magnetometers measure irregularities in the magnetic field in a given area. If a potential UST is identified, the area will be marked out and OER will be notified to discuss any necessary modifications to the sampling plan. In addition, the location of any anomalies will be added to a site plan.

#### **3.2 Soil Sampling**

AKRF proposes to advance the ten borings using a Geoprobe® Direct-Push Probe (DPP) drill rig or similar at approximately the locations shown on Figure 2. If necessary, more advanced drilling technology will be used to complete the site investigation. These locations were selected to supplement the previous sampling conducted as part of the 2006 Phase II investigation. The exact sampling locations will be finalized in the field based on access considerations, utilities, etc.

Utility mark outs will be requested from the New York City/Long Island One Call Center prior to the commencement of drilling.

The borings will be advanced to the water table, anticipated at approximately 45 feet below exterior grade. At each boring, AKRF field personnel [geologist, engineer, Qualified Environmental Professional (QEP) or other qualified technician] will prepare DER-10 compliant boring logs and will screen the soil samples using headspace analysis during borehole advancement for organic vapors with a photo-ionization detector (PID) and for visual and olfactory impacts prior to collecting environmental samples. All field work will be recorded in a field log.

Soil cores will be obtained in a stainless steel, macro-core sampler with an internal acetate liner. Two discrete (grab) soil samples will be collected from each boring from the 0-2 feet below grade interval and from the two-foot interval directly below the approximate bottom of the proposed excavation or just above the water table. If elevated PID, visual, or olfactory evidence of contamination is encountered during borehole advancement, a third soil sample will be collected from the two-foot interval exhibiting the greatest evidence of contamination.

Soil samples will be selected for laboratory analysis and analyzed by a New York State Department of Health (NYSDOH)-certified laboratory for target compound list (TCL) VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, and Target Analyte List (TAL) metals.

### 3.3 **Groundwater Sampling**

Groundwater samples will be collected, if possible, from up to four borings by installing pre-packed well points. The wells will be purged of three to five times its volume prior to sampling using a peristaltic pump and dedicated polyethylene tubing. The samples will be field screened for evidence of contamination (i.e., odor, sheen and PID reading). Sampling will be conducted in accordance with NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and Sampling Guidelines and Protocols, dated March 1991. Groundwater wells will be gauged with a water level meter to record a depth to groundwater reading (1/100 foot), and if necessary, an interface meter to determine the thickness of LNAPL or DNAPL. The well casings will be surveyed by a NYS licensed surveyor to facilitate preparation of a groundwater contour map and determine the direction of groundwater flow. The planned locations of the groundwater samples are shown on Figure 2.

Samples will be analyzed by a New York State Department of Health-certified laboratory for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, pesticides using EPA Method 8081, PCBs using EPA Method 8082, and the TAL list of metals using the (6000/7000 series). The groundwater analyses for metals will be conducted on both filtered and unfiltered samples. In addition, since dewatering is anticipated, an additional set of groundwater samples will be collected from one of the locations for the NYCDEP list of groundwater effluent parameters.

### 3.4 **Soil Gas Sampling**

Soil gas samples will be collected from six locations as shown on Figure 2. The proposed samples will be collected from points installed approximately two feet below grade.

Soil vapor samples will be collected using a Geoprobe direct-push probe (DPP). Samples will be collected into six-liter stainless steel Summa canisters that have been certified clean by the laboratory, each with a flow controller calibrated for sample collection over two hours. Flow rate of both purging and sampling will not exceed 0.2 liters per minutes (L/min). All samples will be collected in accordance with the New York State Department of Health (NYSDOH) Final

Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols. 24-hours following soil vapor probe installation, one to three implant volumes shall be purged prior to the collection of any soil-gas samples. A helium tracer gas will be used in accordance with NYSDOH protocols to verify the integrity of the soil vapor probe seal. A box, bucket, or other enclosure will serve to keep the tracer gas in contact with the probe entry point, and a portable helium monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. As the conclusion of the sampling round, tracer monitoring will be performed a second time to confirm the integrity of the probe seals. One ambient outdoor air sample will be collected for QA purposes.

Canisters will be analyzed by a NYSDOH-certified laboratory for VOCs by EPA Method TO-15.

#### **4.0 SAMPLE ANALYSIS**

Soil and groundwater samples will be submitted to a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory for analysis consisting of:

- TCL VOCs by EPA Method 8260;
- TCL SVOCs by EPA Method 8270;
- PCBs by EPA Method 8082;
- Pesticides by EPA Method 8081 (shallow samples only); and
- TAL metals by EPA Method 6010 and 7471 (all groundwater samples will be analyzed for both filtered and unfiltered metals).

If either light non-aqueous phase liquid (LNAPL) and/or dense non-aqueous phase liquid (DNAPL) are detected, appropriate samples will be collected for characterization and “fingerprint analysis” and required regulatory reporting (i.e., spills hotline) will be performed. The outdoor air and soil vapor samples will be analyzed for VOCs by using USEPA Method TO-15.

##### **4.1 Laboratory Methods**

A NYSDOH ELAP-certified laboratory will perform all analytical work. The laboratory will operate a Quality Assurance/Quality Control (QA/QC) program that will consist of proper laboratory practices (including the required chain-of-custody), an internal quality control program, and external quality control audits by New York State.

##### **4.2 Field Quality Control Sampling**

Quality assurance/quality control (QA/QC) procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. For QA/QC purposes, one trip blank will be sent with the collected samples for laboratory analysis.

The trip blank will be analyzed only for VOCs by EPA Method 8260 to check for contamination during transport and sampling procedures. Two duplicate samples (one soil and one groundwater sample) will be collected to evaluate field sampling precision or reproducibility of measurements of the same parameter under the given set of conditions.

#### **4.3 Sample Custody**

To ensure the integrity of samples taken, a strict chain of custody record must be maintained on each sample. This begins after sampling with the entry in the sampler's field log book of the sampling details:

- a) Date and time of sampling;
- b) Sample location (as specific as possible);
- c) The unique sample number, size, and container(s) used;
- d) Sample description;
- e) Weather conditions (if applicable); and
- f) Any additional comments.

In addition, a record must be kept of the sample's progress from the sample site to the laboratory where it will be analyzed. This is the chain-of-custody form. The form must include:

- a) The sample number;
- b) The sampler's name;
- c) Date and time of sampling;
- d) Location at which the sample was taken, including the address, if possible;
- e) A description of the sample, as best known;
- f) Signatures of people involved in the chain of possession; and
- g) Inclusive dates of possession of each person in the chain.

The chain-of-custody form must accompany the sample throughout its trip to the laboratory. If the sample(s) must be shipped to a laboratory, most shipping agents will refuse to sign or separately carry the chain-of-custody form. In this one case, it is permissible to put the chain-of-custody form into the box with the sample and then seal the box. The recipient of the box, the laboratory's sample custodian, can then attest to the box's arrival still sealed and unopened.

Accompanying the chain-of-custody record, or included in it, must be a request to the laboratory for sample analyses. Information required includes:

- a) Name of person receiving the sample;
- b) Laboratory sample number;
- c) Date of sample receipt;
- d) Sample allocation; and
- e) Analyses to be performed.

Finally, on arrival at the laboratory, the sample custodian must enter the sample in the laboratory's sample log book. The chain-of-custody should be kept on file at the laboratory.

#### 4.4 Field Decontamination Procedures

To avoid contamination and cross-contamination of samples, all sampling equipment will be cleaned before collection of each sample. The following field procedures will be followed for all samples:

1. Scrub using tap water/Simple Green<sup>®</sup> mixture and bristle brush
2. Rinse with tap water.
3. Scrub again with tap water/ Simple Green<sup>®</sup> and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air dry the equipment.

#### 4.5 Investigation Derived Waste

Cuttings may be disposed at the site within the borehole that generated them to within 24 inches of the surface unless:

- Free product or grossly contaminated soil, are present in the cuttings;
- The borehole has penetrated an aquitard, aquiclude or other confining layer; or extends significantly into bedrock;
- Backfilling the borehole with cuttings will create a significant path for vertical movement of contaminants. Soil additives (bentonite) may be added to the cuttings to reduce permeability; and
- The soil cannot fit into the borehole.

Those soil cuttings needing to be managed on-site will be containerized in properly labeled DOT approved 55-gallon drums for future off-site disposal at a permitted facility. All boreholes which require drill cuttings disposal would ultimately be filled with bentonite chips (hydrated) and asphalt/concrete capping. Disposable sampling equipment including, spoons, gloves, bags, paper towels, etc. that came in contact with environmental media will be double bagged and disposed as municipal trash in a facility trash dumpster as non-hazardous trash. In addition, groundwater evacuated from the well during purging and sampling, and decontamination fluids will also be containerized in properly labeled DOT approved 55-gallon drums for future off-site disposal at a permitted facility.

## 5.0 REPORTING

A Remedial Investigation Report (RIR) will be prepared following completion of the field activities and receipt of the laboratory data. The Report will be prepared using the OER template for the RIR and will provide detailed summaries of the investigative findings. Soil, groundwater, and soil vapor analytical results will be compared to the NYSDEC Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives, appropriate Part 375-6.8(b) Restricted Soil Cleanup Objectives; and Part 703 Groundwater Quality Standards (GQS) (class GA) or Division of Water TOGS 1.1.1 Ambient Water Quality Standards; and NYSDOH October 2006 Final Guidance for Evaluating Soil Vapor Intrusion Matrices, respectively. The Report will include an updated Site Plan and complete analytical summary tables from all constituent compounds (even if non-detectable concentrations are revealed). In addition, the report will also include a summary of the previous soil and groundwater results from the 2006 Phase II investigation.

## **6.0 INVESTIGATION HASP**

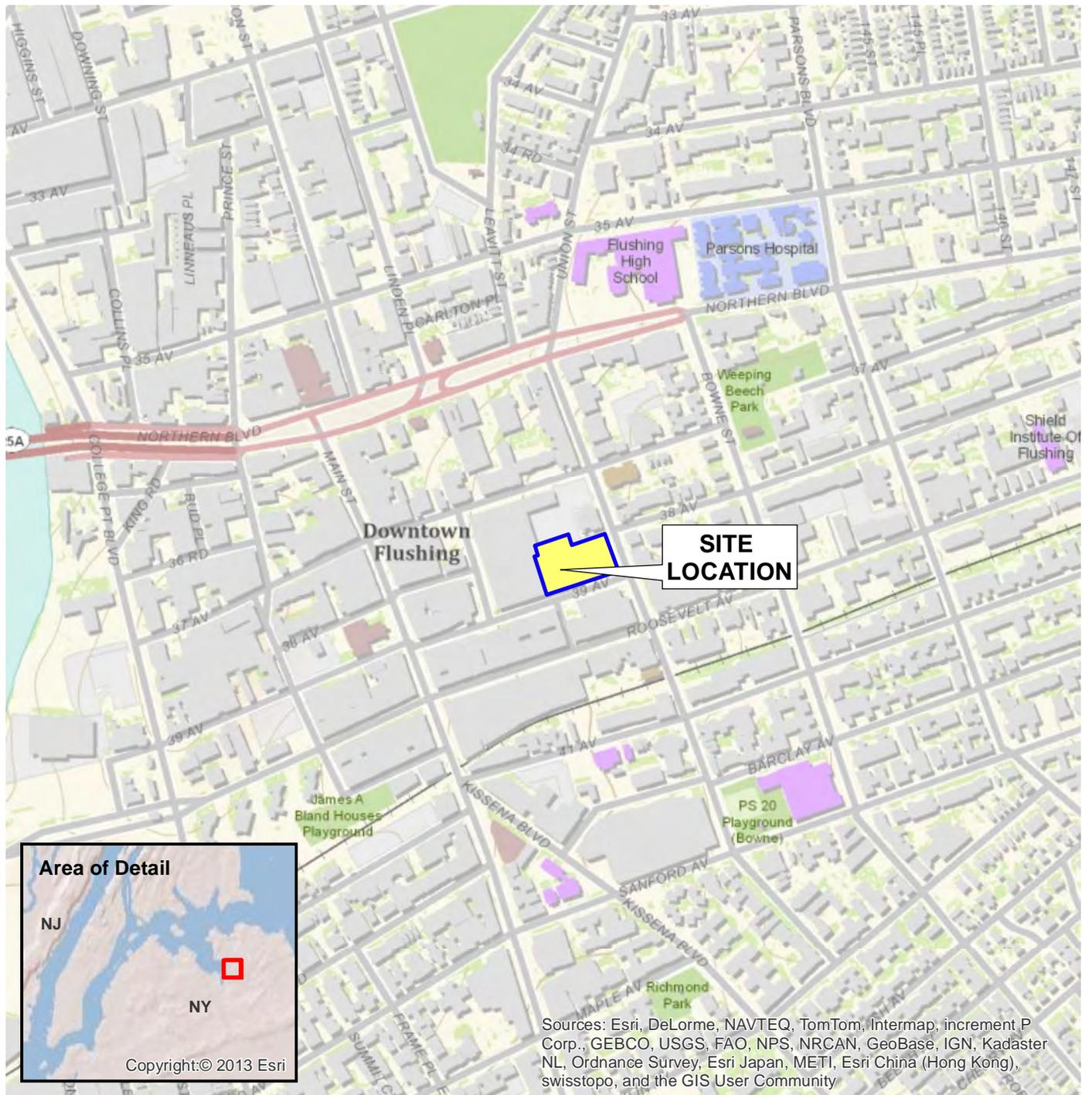
The investigation Health and Safety Plan (HASP) is included in Appendix A. The Site Safety Coordinator will be determined prior to the initiation of the field work. Investigative work performed under this Work Plan will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the investigation work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations.

All field personnel involved in investigation activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form. Potential on-site chemicals of concern include VOCs, SVOCs, Pesticides/PCBs, and Heavy Metals (specifically arsenic, lead, and mercury at a minimum). Information fact sheets for each contaminant group and/or MSDS' are included in the HASP.

An emergency contact sheet with names and phone numbers for all pertinent project personnel as well as regulatory hotline information is included in the HASP. That document will define the specific project contacts for use in case of emergency.

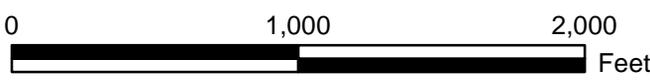
## **FIGURES**



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

**SOURCE**  
USGS 7.5 Minute Topographic Map  
FLUSHING Quad 2011

**Legend**  
 Parcel 1A Site Location



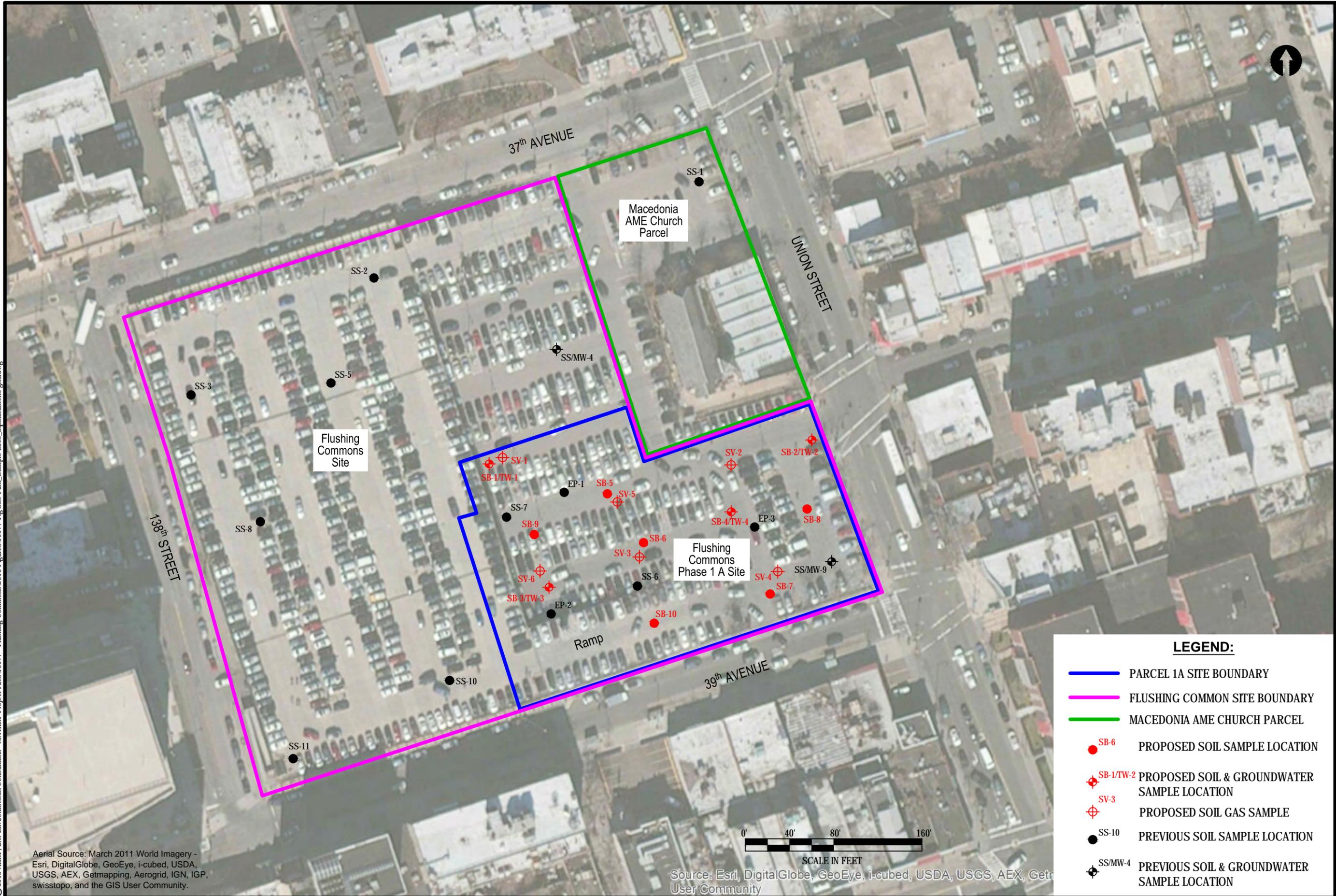
**Flushing Commons Parcel 1A**  
Queens, New York

**SITE LOCATION MAP**

**AKRF**  
Environmental Consultants  
440 Park Avenue South, New York, N.Y. 10016

DATE <b>10/11/2013</b>
PROJECT No. <b>10677</b>
FIGURE <b>1</b>

© 2013 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\10677 - Flushing Commons\2013 Figures\10677 Fig Site Plan\_Sample Locs\_alphanumric\_grd.dwg



Aerial Source: March 2011 World Imagery - Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Environmental Consultants  
440 Park Avenue South, New York, NY 10016

**FLUSHING COMMONS PARCEL 1A**  
Queens, New York  
**SITE PLAN WITH SAMPLE LOCATIONS**

**LEGEND:**

-  PARCEL 1A SITE BOUNDARY
-  FLUSHING COMMON SITE BOUNDARY
-  MACEDONIA AME CHURCH PARCEL
-  SB-6 PROPOSED SOIL SAMPLE LOCATION
-  SB-1/TW-2 PROPOSED SOIL & GROUNDWATER SAMPLE LOCATION
-  SV-3 PROPOSED SOIL GAS SAMPLE
-  SS-10 PREVIOUS SOIL SAMPLE LOCATION
-  SS/MW-4 PREVIOUS SOIL & GROUNDWATER SAMPLE LOCATION

DATE  
1.9.2014

PROJECT NO.  
10677

SCALE  
as shown

FIGURE  
2

**Appendix A**  
**Health and Safety Plan**

# Health and Safety Plan

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## Flushing Commons Phase 1A

38-18 Union Street  
Block 4978, Lot 25  
Flushing, New York

AKRF Project Number: 10677

CEQR Number 06DME010Q  
NYCDEP File 06DEPTECH098Q

**Prepared for:**

**Flushing Commons, LLC**  
% Rockefeller Group Development Corporation  
1221 Avenue of Americas, 29<sup>th</sup> Floor  
New York, New York 10020-1095

**Prepared by:**



**AKRF, Inc.**  
440 Park Avenue South  
New York, NY 10016  
212-696-0670

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**NOVEMBER 2013**

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## FIGURES

Figure 1 – Project Site Location and Nearest Hospital

## APPENDICES

- APPENDIX A – Potential Health Effects from On-site Contaminants
- APPENDIX B – West Nile Virus/St. Louis Encephalitis Prevention
- APPENDIX C – Report Forms
- APPENDIX D – Emergency Hand Signals

## **1.0 INTRODUCTION**

This environmental Health and Safety Plan (HASP) has been developed for implementation of subsurface investigation activities conducted by all personnel on-site, both AKRF employees and others, for Phase 1A of the Flushing Commons site (the Site). The Phase 1A portion of the Flushing Commons site consists of an approximately 67,600-square foot parcel on the corner of Union Street and 39<sup>th</sup> Avenue in Flushing, New York. The Site is legally defined as Block 4978, portion of Tax Lot 25. The majority of the Site is composed of an asphalt-paved lot utilized for automotive parking purposes. The southwest portion of the Site contains a concrete ramp leading to additional parking on the Flushing Commons site. The proposed development of the Site includes a full build-out across the Site for the construction of two residential structures with four levels of subgrade parking.

This HASP does not discuss other routine health and safety issues common to general construction and excavation, including but not limited to slips, trips, falls, shoring, and other physical hazards. All AKRF employees are directed that all work must be performed in accordance with the Company's Generic HASP and all Occupational Safety and Health Administration (OSHA) applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

## 2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

### 2.1 Hazard Evaluation

Potential health effects from on-site contaminants are provided in Appendix A. The following section provides further information on potential hazards associated with the project.

#### 2.1.1 Hazards of Concern

Check all that apply		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Carbon Monoxide
Comments: No personnel are permitted to enter permit confined spaces.		

#### 2.1.2 Physical Characteristics

Check all that apply		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge
<input checked="" type="checkbox"/> Vapors	<input checked="" type="checkbox"/> Unknown	<input type="checkbox"/> Other
Comments:		

#### 2.1.3 Hazardous Materials

Check all that apply					
Chemicals	Solids	Sludges	Solvents	Oils	Other
<input type="checkbox"/> Acids	<input type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input type="checkbox"/> Halogens	<input type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm
<input type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input type="checkbox"/> Other	<input type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input checked="" type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other: Fill Material	<input type="checkbox"/> Other		<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad
<input type="checkbox"/> Inks	Fill material			<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input type="checkbox"/> PCBs					<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input checked="" type="checkbox"/> Other: VOCs & SVOCs					

### 2.1.4 Chemicals of Concern

<b>Chemicals</b>	<b>REL/PEL/STEL (ppm)</b>	<b>Health Hazards</b>
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
Tetrachloroethylene (PCE)	PEL = 100 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Trichloroethylene (TCE)	PEL = 100 ppm REL = 25 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Naphthalene	REL = 10 ppm PEL = 10 ppm	Irritation eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage
Fuel Oil	REL = 350 mg/m <sup>3</sup> PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Lead	REL= 0.1 mg/m <sup>3</sup> PEL= 0.05 mg/m <sup>3</sup>	Weak, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis wrists and ankles; encephalopathy; kidney disease; irritation eyes; hypotension.
Polycyclic Aromatic Hydrocarbons (PAHs)	REL = 0.1 mg/m <sup>3</sup> PEL = 0.2 mg/m <sup>3</sup>	Irritation skin, body fluids; reduced ability to fight disease; birth defects; carcinogen
Mercury	REL= 0.05 mg/m <sup>3</sup> PEL= 0.1 mg/m <sup>3</sup>	irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
MTBE	REL = NA PEL = NA	Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases.

		Vapors may cause dizziness or suffocation.
Nickel	REL = 0.015 mg/m <sup>3</sup> PEL = 1 mg/m <sup>3</sup>	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].
Particulate	PEL = 15 mg/m <sup>3</sup> (total) PEL = 5 mg/m <sup>3</sup> (respirable)	Irritation eyes, skin, throat, upper respiratory system
<p><b>Comments:</b> REL = NIOSH Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit mg/m<sup>3</sup> = milligrams per cubic meter ppm = parts per million</p>		

**2.1.5 West Nile Virus**

The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. Information provided by the CDC Division of Vector-Borne Infectious Diseases on this issue is provided in Appendix B.

**2.2 Designated Personnel**

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will have a 4-year college degree in occupational safety or a related science/engineering field, and experience in implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel are outlined in Section 2.3 of this HASP.

**2.3 Training**

All personnel who enter the work area while intrusive activities are being performed will have completed a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

- Make them aware of the potential hazards they may encounter;
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety; Make them aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the field crew will be instructed in these objectives before he/she goes onto the site. A site safety meeting will be conducted at the start of the project. Additional meetings shall be conducted, as necessary, for new personnel working at the site.

**2.4 Medical Surveillance Program**

All AKRF and subcontractor personnel performing field work involving subsurface disturbance at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician’s medical release for work will be confirmed by the SSO

before an employee can begin site activities. The medical release shall consider the type of work to be performed and the required personal protective equipment (PPE). The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste site work.

## 2.5 Site Work Zones

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of contamination, ensure that proper protective equipment is donned, and provide an area for decontamination. Emergency hand signals are provided in Appendix D.

The Exclusion Zone is defined as the area where exposure to impacted media could be encountered. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located next to the Exclusion Zone. The Support is the zone area where support facilities such as vehicles, fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would assemble in the event of an emergency. A summary of these areas is provided below. These zones may be changed by the SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

<b>Task</b>	<b>Exclusion Zone</b>	<b>CRZ</b>	<b>Support Zone</b>
Subsurface Investigation	10 ft from drill rig	25 ft from drill rig	As Needed
<u>Comments:</u> Control measures such as "caution tape" and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

## 2.6 Air Monitoring

The purpose of the air monitoring program is to identify any exposure of the field personnel to potential environmental hazards in the soil and groundwater. Results of the air monitoring will be used to determine the appropriate response action, if needed.

### 2.6.1 Volatile Organic Compounds

An organic vapor meter (OVM) will be used to perform air monitoring during soil disturbance activities to determine airborne levels of total VOCs. The OVM will be calibrated at the start of the work day with a 100 ppm isobutylene standard.

### 2.6.2 Work Zone Air Monitoring

Real time air monitoring will be performed with the OVM. Measurements will be taken prior to commencement of work and continuously during the work, as outlined in the following table. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO shall set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table.

Instrument	Action Level	Response Action
OVM	Less than 10 ppm in breathing zone	Level D or D-Modified
	Between 10 ppm and 20 ppm	Level C
	More than 20 ppm	Stop work. Resume work when readings are less then 20 ppm.

**2.7 Personal Protection Equipment**

The personal protection equipment required for various kinds of site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, “General Description and Discussion of the Levels of Protection and Protective Gear.”

AKRF field personnel and other site personnel shall wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 2.6.

LEVEL OF PROTECTION & PPE		Drilling/Sampling
<b>Level D</b> <input checked="" type="checkbox"/> Steel Toe Shoes <input checked="" type="checkbox"/> Hard Hat (within 25 ft of drill rig) <input checked="" type="checkbox"/> Work Gloves	<input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> Face Shield <input checked="" type="checkbox"/> Ear Plugs (within 25 ft of excavator) <input checked="" type="checkbox"/> Latex Gloves <input checked="" type="checkbox"/> Tyvek for driller if NAPL present	Yes
<b>Level C (in addition to Level D)</b> <input checked="" type="checkbox"/> Half-Face Respirator OR <input checked="" type="checkbox"/> Full Face Respirator <input type="checkbox"/> Full-Face PAPR	<input type="checkbox"/> Particulate Cartridge <input type="checkbox"/> Organic Cartridge <input checked="" type="checkbox"/> Dual Organic/Particulate Cartridge	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected).		

**2.8 General Work Practices**

To protect the health and safety of the field personnel, field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.

- The workers should shower as soon as possible after leaving the site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions. Where radio communications is not available, air-horn and/or hand signals will be used as indicated in Appendix D.

### **3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN**

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be driven to a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is attached. An emergency/injury report for is provided as Appendix C.

#### **3.1 Hospital Directions**

The location of the nearest hospital, as shown on Figure 1, is **Flushing Hospital Medical Center**. The address of the hospital is 4500 Parsons Boulevard. The emergency room is on Delaware Avenue, between Burling Street and Parsons Avenue.

<b>Hospital Name:</b>	Flushing Hospital Medical Center
<b>Phone Number:</b>	(718) 670-1191
<b>Address/Location:</b>	4500 Parsons Blvd, Flushing, NY 11355 Intersection of Parsons Blvd and 45 <sup>th</sup> Avenue
<b>Directions:</b>	LEFT on 39 <sup>th</sup> Avenue (one way) RIGHT onto Union Street LEFT onto Roosevelt Avenue RIGHT onto Parsons Blvd RIGHT onto Delaware Avenue  <b>The emergency room entrance to Flushing Hospital Medical Center emergency room is on Delaware Avenue, between Burling Street and Parsons Avenue.</b>

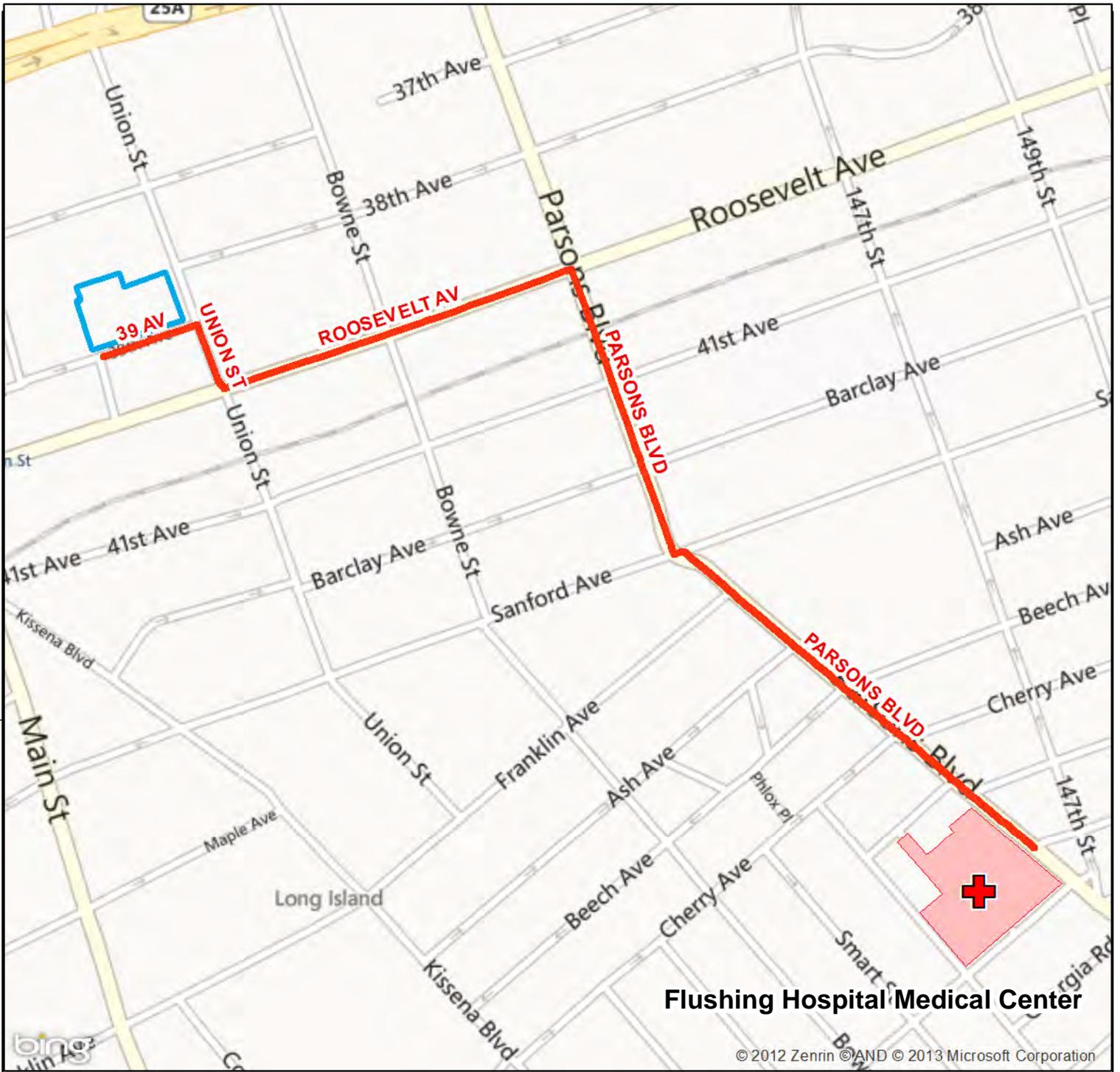
### 3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Marc Godick	Project Director	914-922-2356 (office)
	Stephen Malinowski	Project Manager	631-574-3724 (office) 631-974-5755 (cell)
Rockefeller Group Development Corporation	Wendy Catro-Farrell	Client	(212) 282-2016 (office)
NYC OER	Shana Holberton	Project Manager	(212)788-3220
Ambulance, Fire Department & Police Department	-	-	<b>911</b>
NYSDEC Spill Hotline	-	-	<b>800-457-7362</b>



**FIGURE 1**  
**HOSPITAL ROUTE MAP**

© 2013 AKRF, Inc. Environmental Consultants O:\Projects\10677 - FLUSHING COMMONS MIXED USED DEV\Hazmat\10677 Route to Hospital.mxd



**Flushing Hospital Medical Center**

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**Legend**

-  Route to Hospital
-  Parcel 1A



Flushing Hospital Medical Center  
 4500 Parsons Blvd  
 Flushing, NY 11355

**Flushing Commons Parcel 1A**  
 Queens, New York



DATE  
**10/16/2013**

PROJECT No.  
**10677**

**HOSPITAL LOCATION MAP**

Environmental Consultants  
 440 Park Avenue South, New York, N.Y. 10016

FIGURE  
**1**

**APPENDIX A**  
**POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS**

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 1,001 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

### What is benzene?

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

### What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

### How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Working in industries that make or use benzene.

### How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

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Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene will affect fertility in men.

### **How likely is benzene to cause cancer?**

Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia, often referred to as AML. This is a cancer of the blood-forming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen. The International Agency for Research on Cancer (IARC) and the EPA have determined that benzene is carcinogenic to humans.

### **How can benzene affect children?**

Children can be affected by benzene exposure in the same ways as adults. It is not known if children are more susceptible to benzene poisoning than adults.

Benzene can pass from the mother's blood to a fetus. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

### **How can families reduce the risks of exposure to benzene?**

Benzene exposure can be reduced by limiting contact with gasoline and cigarette smoke. Families are encouraged not to smoke in their house, in enclosed environments, or near their children.

### **Is there a medical test to determine whether I've been exposed to benzene?**

Several tests can show if you have been exposed to benzene. There is a test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood; however, since benzene disappears

rapidly from the blood, this test is only useful for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. The metabolite S-phenylmercapturic acid in urine is a sensitive indicator of benzene exposure. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

### **Has the federal government made recommendations to protect human health?**

The EPA has set the maximum permissible level of benzene in drinking water at 5 parts benzene per billion parts of water (5 ppb).

The Occupational Safety and Health Administration (OSHA) has set limits of 1 part benzene per million parts of workplace air (1 ppm) for 8 hour shifts and 40 hour work weeks.

### **References**

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Benzene (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is ethylbenzene?

(Pronounced ěth' əl bĕn' zĕn')

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

### What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

### How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

### How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

### How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classified as to human carcinogenicity.

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No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

### How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

### How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

### Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and

some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

### Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,026 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What is lead?

(Pronounced lĕd)

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays.

Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

## What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.
- Much of the lead in inner-city soils comes from old houses painted with lead-based paint.

## How might I be exposed to lead?

- Eating food or drinking water that contains lead.
- Spending time in areas where lead-based paints have been used and are deteriorating.
- Working in a job where lead is used.
- Using health-care products or folk remedies that contain lead.
- Engaging in certain hobbies in which lead is used (for example, stained glass).

## How can lead affect my health?

Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed.

At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can also damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

## How likely is lead to cause cancer?

The Department of Health and Human Services has determined that lead acetate and lead phosphate may reasonably

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be anticipated to be carcinogens based on studies in animals. There is inadequate evidence to clearly determine lead's carcinogenicity in people.

### How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. A large amount of lead might get into a child's body if the child ate small pieces of old paint that contained large amounts of lead. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

### How can families reduce the risk of exposure to lead?

Avoid exposure to sources of lead. Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint (homes built before 1978). Run your water for 15 to 30 seconds before drinking or cooking with it. This will get rid of lead that may have leached out of pipes. Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children. Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

### Is there a medical test to show whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth and bones can be measured with X-rays, but this test is not as readily available. Medical treatment may be necessary in children if the lead concentration in blood is higher than 45 micrograms per deciliter (45 µg/dL).

### Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that children ages 1 and 2 be screened for lead poisoning. Children who are 3 to 6 years old should be tested for lead if they have never been tested for lead before and if they receive services from public assistance programs; if they live in or regularly visit a building built before 1950; if they live in or visit a home built before 1978 that is being remodeled; or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers children to have an elevated level of lead if the amount in the blood is 10 µg/dL.

The EPA requires lead in air not to exceed 1.5 micrograms per cubic meter (1.5 µg/m<sup>3</sup>) averaged over 3 months. EPA limits lead in drinking water to 15 µg per liter.

The Occupational Health and Safety Administration (OSHA) develops regulations for workers exposed to lead. The Clean Air Act Amendments of 1990 banned the sale of leaded gasoline. The Federal Hazardous Substance Act bans children's products that contain hazardous amounts of lead.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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This fact sheet answers the most frequently asked health questions (FAQs) about methyl *tert*-butyl ether (MTBE). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Methyl *tert*-butyl ether (MTBE) is a flammable liquid which is used as an additive in unleaded gasoline. Drinking or breathing MTBE may cause nausea, nose and throat irritation, and nervous system effects. MTBE has been found in at least 11 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is methyl *tert*-butyl ether?

(Pronounced məth'əl tūr'shē-ēr'ē byōōt'l ē'thər)

Methyl *tert*-butyl ether (MTBE) is a flammable liquid with a distinctive, disagreeable odor. It is made from blending chemicals such as isobutylene and methanol, and has been used since the 1980s as an additive for unleaded gasolines to achieve more efficient burning.

MTBE is also used to dissolve gallstones. Patients treated in this way have MTBE delivered directly to their gall bladders through special tubes that are surgically inserted.

### What happens to MTBE when it enters the environment?

- MTBE quickly evaporates from open containers and surface water, so it is commonly found as a vapor in the air.
- Small amounts of MTBE may dissolve in water and get into underground water.
- It remains in underground water for a long time.

- MTBE may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- MTBE may be broken down quickly in the air by sunlight.
- MTBE does not build up significantly in plants and animals.

### How might I be exposed to MTBE?

- Touching the skin or breathing contaminated air while pumping gasoline.
- Breathing exhaust fumes while driving a car.
- Breathing air near highways or in cities.
- Drinking, swimming, or showering in water that has been contaminated with MTBE.
- Receiving MTBE treatment for gallstones.

### How can MTBE affect my health?

Breathing small amounts of MTBE for short periods may cause nose and throat irritation. Some people exposed to MTBE while pumping gasoline, driving their cars, or working

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in gas stations have reported having headaches, nausea, dizziness, and mental confusion. However, the actual levels of exposure in these cases are unknown. In addition, these symptoms may have been caused by exposure to other chemicals.

There are no data on the effects in people of drinking MTBE. Studies with rats and mice suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects.

### **How likely is MTBE to cause cancer?**

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE as to its carcinogenicity.

### **Is there a medical test to show whether I've been exposed to MTBE?**

MTBE and its breakdown product, butyl alcohol, can be detected in your breath, blood, or urine for up to 1 or 2 days after exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. There is no other test specific to determining MTBE exposure.

### **Has the federal government made recommendations to protect human health?**

The EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4 milligrams per liter of water (4 mg/L) for an exposure of 1-10 days, and 3 mg/L for longer-term exposures.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an exposure limit of 40 parts of MTBE per million parts of air (40 ppm) for an 8-hour workday, 40-hour workweek.

### **Glossary**

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### **References**

This ToxFAQs information is taken from the 1996 Toxicological Profile for Methyl *tert*-Butyl Ether produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY:** Exposure to naphthalene happens mostly from breathing air contaminated from the burning of wood or fossil fuels, industrial discharges, tobacco smoke, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has been found in at least 536 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What is naphthalene?

(Pronounced năf'thə-lēn')

Naphthalene is a white solid that is found naturally in fossil fuels. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell.

The major products made from naphthalene are moth repellents. It is also used for making dyes, resins, leather, tanning agents, and the insecticide, carbaryl.

## What happens to naphthalene when it enters the environment?

- Naphthalene enters the environment from industrial uses, and from its use as a moth repellent.
- It also enters from the burning of wood or tobacco, and from accidental spills.
- Naphthalene evaporates easily.
- In air, moisture and sunlight break it down, often within 1 day.
- Naphthalene in water is destroyed by bacteria or evaporates into the air.
- Naphthalene binds weakly to soils and sediment.
- It does not accumulate in animals or fish.

- If dairy cows are exposed to naphthalene, some of it will be in their milk.
- If laying hens are exposed, some of it will be in their eggs.

## How might I be exposed to naphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or from burning wood or fossil fuels.
- Breathing air in homes or businesses where cigarettes are smoked, wood is burned, or moth repellents are used.
- Drinking water from contaminated wells.
- Touching clothing, blankets, or coverlets that are treated with naphthalene.

## How can naphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. People, particularly children, have developed this problem after eating naphthalene-containing mothballs or deodorant blocks. Some of the symptoms of this

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problem are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin.

Animals sometimes develop cloudiness in their eyes after swallowing naphthalene. It is not clear if this also develops in people.

When mice were repeatedly exposed to naphthalene vapors for 2 years, their noses and lungs became inflamed and irritated.

### How likely is naphthalene to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) and the EPA have not classified naphthalene as to its human carcinogenicity.

No studies are available in people. Naphthalene has caused cancer in studies in female mice, but not in male mice or in rats of either sex.

### Is there a medical test to show whether I've been exposed to naphthalene?

Tests are available that measure levels of naphthalene and its breakdown products in urine, stool, blood, or maternal milk. A small sample of your body fat can also be removed and analyzed for naphthalene. These tests are not routinely available in a doctor's office. However, a sample taken in a doctor's office can be sent to a special laboratory, if needed.

These tests cannot determine exactly how much naphthalene you were exposed to or predict whether harmful effects will occur.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water containing over 0.5 parts of naphthalene per million parts of water (0.5 ppm) for more than 10 days, or 0.4 ppm for longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime, the EPA suggests it contain no more than 0.02 ppm naphthalene. The EPA requires that discharges or spills into the environment of 100 pounds or more be reported.

The Occupational Safety and Health Administration (OSHA) has set a limit of 10 parts per million (10 ppm) for the level of naphthalene in workplace air over an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) considers more than 250 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

### Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Insecticide: A substance that kills insects.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

### What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

### How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

### How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

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have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

### How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

### Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m<sup>3</sup>) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Sediments: Mud and debris that have settled to the bottom of a body of water.

Soluble: Dissolves in water.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

### What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

### How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

### How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

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have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

### How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

### Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m<sup>3</sup>) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Sediments: Mud and debris that have settled to the bottom of a body of water.

Soluble: Dissolves in water.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

## What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

## How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smoke-houses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

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- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

### How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

### How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

### Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

### Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air ( $0.2 \text{ mg/m}^3$ ). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is  $5 \text{ mg/m}^3$  averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed  $0.1 \text{ mg/m}^3$  for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

### Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

### What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

### What happens to toluene when it enters the environment?

Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leaking underground storage tanks at gasoline stations and other facilities.

When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

Toluene does not usually stay in the environment long.

Toluene does not concentrate or buildup to high levels in animals.

### How might I be exposed to toluene?

Breathing contaminated workplace air or automobile exhaust.

Working with gasoline, kerosene, heating oil, paints, and lacquers.

Drinking contaminated well-water.

Living near uncontrolled hazardous waste sites containing toluene products.

### How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

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hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

### **How likely is toluene to cause cancer?**

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

### **How can toluene affect children?**

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

### **How can families reduce the risk of exposure to toluene?**

- Use toluene-containing products in well-ventilated areas.

- When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

### **Is there a medical test to show whether I've been exposed to toluene?**

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

### **Has the federal government made recommendations to protect human health?**

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

### **References**

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are fuel oils?

(Pronounced fyoo'el oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

## What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.

- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

## How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

## How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

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stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

### How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

### Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of

the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

### Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m<sup>3</sup>) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

### Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

### What happens to trichloroethylene when it enters the environment?

- ❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
- ❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
- ❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
- ❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- ❑ Trichloroethylene does not build up significantly in

plants and animals.

### How might I be exposed to trichloroethylene?

- ❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.
- ❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
- ❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
- ❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

### How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

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Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

### How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9<sup>th</sup> Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”

### Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood

and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

### Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

Solvent: A chemical that dissolves other substances.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is tetrachloroethylene?

(Pronounced tět'rə-klôr' 0-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

### What happens to tetrachloroethylene when it enters the environment?

- Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- It does not appear to collect in fish or other animals that live in water.

### How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it.

### How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

### How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

### Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be per-

formed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

### Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about total petroleum hydrocarbons (TPH). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**HIGHLIGHTS: TPH is a mixture of many different compounds. Everyone is exposed to TPH from many sources, including gasoline pumps, spilled oil on pavement, and chemicals used at home or work. Some TPH compounds can affect your nervous system, causing headaches and dizziness. TPH has been found in at least 23 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are total petroleum hydrocarbons?

(Pronounced tōt'l pə-trō'lē-əm hī'drə-kär'bənz)

Total petroleum hydrocarbons (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount of TPH at a site.

TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals.

Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. However, it is likely that samples of TPH will contain only some, or a mixture, of these chemicals.

## What happens to TPH when it enters the environment?

- TPH may enter the environment through accidents, from industrial releases, or as byproducts from commercial or private uses.
- TPH may be released directly into water through spills or leaks.
- Some TPH fractions will float on the water and form surface films.
- Other TPH fractions will sink to the bottom sediments.
- Bacteria and microorganisms in the water may break down some of the TPH fractions.
- Some TPH fractions will move into the soil where they may stay for a long time.

## How might I be exposed to TPH?

- Everyone is exposed to TPH from many sources.
- Breathing air at gasoline stations, using chemicals at home or work, or using certain pesticides.
- Drinking water contaminated with TPH.
- Working in occupations that use petroleum products.
- Living in an area near a spill or leak of petroleum products.
- Touching soil contaminated with TPH.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

### How can TPH affect my health?

Some of the TPH compounds can affect your central nervous system. One compound can cause headaches and dizziness at high levels in the air. Another compound can cause a nerve disorder called "peripheral neuropathy," consisting of numbness in the feet and legs. Other TPH compounds can cause effects on the blood, immune system, lungs, skin, and eyes.

Animal studies have shown effects on the lungs, central nervous system, liver, and kidney from exposure to TPH compounds. Some TPH compounds have also been shown to affect reproduction and the developing fetus in animals.

### How likely is TPH to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that one TPH compound (benzene) is carcinogenic to humans. IARC has determined that other TPH compounds (benzo[a]pyrene and gasoline) are probably and possibly carcinogenic to humans. Most of the other TPH compounds are considered not to be classifiable by IARC.

### Is there a medical test to show whether I've been exposed to TPH?

There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds. Exposure to kerosene can be determined by its smell on the breath or clothing. Benzene can be measured in exhaled air and a breakdown product of benzene can be measured in urine. Other TPH compounds can be measured in blood, urine, breath, and some body tissues.

### Has the federal government made recommendations to protect human health?

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds:

The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration has set an exposure limit of 500 parts of petroleum distillates per million parts of air (500 ppm) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Immune system: Body organs and cells that fight disease.

Pesticides: Chemicals used to kill pests.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for total petroleum hydrocarbons (TPH). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. Xylene has been found in at least 844 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

### What is xylene?

There are three forms of xylene in which the methyl groups vary on the benzene ring: *meta*-xylene, *ortho*-xylene, and *para*-xylene (*m*-, *o*-, and *p*-xylene). These different forms are referred to as isomers.

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar. Chemical industries produce xylene from petroleum. It is one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

### What happens to xylene when it enters the environment?

- Xylene evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and other animals living in xylene-contaminated water.

### How might I be exposed to xylene?

- Using a variety of consumer products including gasoline, paint, varnish, shellac, rust preventives, and cigarette smoke. Xylene can be absorbed through the respiratory tract and through the skin.
- Ingesting xylene-contaminated food or water, although these levels are likely to be very low.
- Working in a job that involves the use of xylene such as painters, paint industry workers, biomedical laboratory workers, automobile garage workers, metal workers, and furniture refinishers.

### How can xylene affect my health?

No health effects have been noted at the background levels that people are exposed to on a daily basis.

High levels of exposure for short or long periods can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

### How likely is xylene to cause cancer?

Both the International Agency for Research on Cancer (IARC) and the EPA have found that there is insufficient information to determine whether or not xylene is carcinogenic.

### How can xylene affect children?

The effects of xylene have not been studied in children, but it is likely that they would be similar to those seen in exposed adults. Although there is no direct evidence, children may be more sensitive to acute inhalation exposure than adults because their narrower airways would be more sensitive to swelling effects.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

### How can families reduce the risks of exposure to xylene?

- Exposure to xylene as solvents (in paints or gasoline) can be reduced if the products are used with adequate ventilation and if they are stored in tightly closed containers out of the reach of small children.
- Sometimes older children sniff household chemicals in attempt to get high. Talk with your children about the dangers of sniffing xylene.
- If products containing xylene are spilled on the skin, then the excess should be wiped off and the area cleaned with soap and water.

### Is there a medical test to determine whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

### Has the federal government made recommendations to protect human health?

The EPA set a limit of 10 parts xylene per million parts drinking water (10 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 100 parts xylene per million parts of workplace air (100 ppm) for 8 hour shifts and 40 hour work weeks.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Xylene (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.**

### What is mercury?

(Pronounced mŭr/kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

### What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

### How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

### How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

### How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

### How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

### How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

### Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

### Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m<sup>3</sup>) and 0.05 mg/m<sup>3</sup> of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**APPENDIX B**  
**WEST NILE VIRUS/St. LOUIS ENCEPHALITIS PREVENTION**

## WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the CDC Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

**APPENDIX C**  
**REPORT FORMS**

## WEEKLY SAFETY REPORT FORM

Week Ending: \_\_\_\_\_ Project Name/Number: \_\_\_\_\_

Report Date: \_\_\_\_\_ Project Manager Name: \_\_\_\_\_

Summary of any violations of procedures occurring that week:

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Summary of any job related injuries, illnesses, or near misses that week:

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Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

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Comments:

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Name: \_\_\_\_\_ Company: \_\_\_\_\_

Signature: \_\_\_\_\_ Title: \_\_\_\_\_



**INJURED - ILL:**

Name: \_\_\_\_\_ SSN: \_\_\_\_\_

Address: \_\_\_\_\_ Age: \_\_\_\_\_

Length of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Time/Classification: \_\_\_\_\_

**SEVERITY OF INJURY OR ILLNESS:**

\_\_\_ Disabling                      \_\_\_ Non-disabling                      \_\_\_ Fatality

\_\_\_ Medical Treatment                      \_\_\_ First Aid Only

**ESTIMATED NUMBER OF DAYS AWAY FROM JOB:** \_\_\_\_\_

**NATURE OF INJURY OR ILLNESS:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**CLASSIFICATION OF INJURY:**

- |                    |                       |                            |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions      | _____ Dislocations    | _____ Punctures            |
| ___ Bites          | _____ Faint/Dizziness | _____ Radiation Burns      |
| ___ Blisters       | _____ Fractures       | _____ Respiratory Allergy  |
| ___ Bruises        | _____ Frostbite       | _____ Sprains              |
| ___ Chemical Burns | _____ Heat Burns      | _____ Toxic Resp. Exposure |
| ___ Cold Exposure  | _____ Heat Exhaustion | _____ Toxic Ingestion      |
| ___ Concussion     | _____ Heat Stroke     | _____ Dermal Allergy       |
| ___ Lacerations    |                       |                            |

Part of Body Affected: \_\_\_\_\_

Degree of Disability: \_\_\_\_\_

Date Medical Care was Received: \_\_\_\_\_

Where Medical Care was Received: \_\_\_\_\_

Address (if off-site): \_\_\_\_\_

(If two or more injuries, record on separate sheets)

**PROPERTY DAMAGE:**

Description of Damage: \_\_\_\_\_

Cost of Damage:                   \$ \_\_\_\_\_

**ACCIDENT/INCIDENT LOCATION:** \_\_\_\_\_

**ACCIDENT/INCIDENT ANALYSIS:** Causative agent most directly related to accident/incident  
(Object, substance, material, machinery, equipment, conditions)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Was weather a factor?: \_\_\_\_\_

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

\_\_\_\_\_  
\_\_\_\_\_

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

\_\_\_\_\_

**ON-SITE ACCIDENTS/INCIDENTS:**

Level of personal protection equipment required in Site Safety Plan:

\_\_\_\_\_

Modifications:

Was injured using required equipment?:

\_\_\_\_\_

If not, how did actual equipment use differ from plan?:

\_\_\_\_\_  
\_\_\_\_\_

**ACTION TAKEN TO PREVENT RECURRENCE:** (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

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**ACCIDENT/INCIDENT REPORT REVIEWED BY:**

\_\_\_\_\_  
SSO Name Printed

\_\_\_\_\_  
SSO Signature

**OTHERS PARTICIPATING IN INVESTIGATION:**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ACCIDENT/INCIDENT FOLLOW-UP:**      Date: \_\_\_\_\_

Outcome of accident/incident: \_\_\_\_\_

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Physician's recommendations: \_\_\_\_\_

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---

Date injured returned to work: \_\_\_\_\_

Follow-up performed by:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM**

**APPENDIX D**  
**EMERGENCY HAND SIGNALS**

## EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

### EMERGENCY HAND SIGNALS

**OUT OF AIR, CAN'T BREATHE!**



**Hand gripping throat**

**LEAVE AREA IMMEDIATELY,  
NO DEBATE!**

**(No Picture) Grip partner's wrist or place both hands around waist**

**NEED ASSISTANCE!**



**Hands on top of head**

**OKAY! – I'M ALL RIGHT!**

**- I UNDERSTAND!**



**Thumbs up**

**NO! - NEGATIVE!**



**Thumbs down**

**APPENDIX B**  
**WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION**

## WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the CDC Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

**APPENDIX C**  
**REPORT FORMS**

## WEEKLY SAFETY REPORT FORM

Week Ending: \_\_\_\_\_ Project Name/Number: \_\_\_\_\_

Report Date: \_\_\_\_\_ Project Manager Name: \_\_\_\_\_

Summary of any violations of procedures occurring that week:

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Summary of any job related injuries, illnesses, or near misses that week:

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Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

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Comments:

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Name: \_\_\_\_\_ Company: \_\_\_\_\_

Signature: \_\_\_\_\_ Title: \_\_\_\_\_



**INJURED - ILL:**

Name: \_\_\_\_\_ SSN: \_\_\_\_\_

Address: \_\_\_\_\_ Age: \_\_\_\_\_

Length of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Time/Classification: \_\_\_\_\_

**SEVERITY OF INJURY OR ILLNESS:**

\_\_\_ Disabling                      \_\_\_ Non-disabling                      \_\_\_ Fatality

\_\_\_ Medical Treatment                      \_\_\_ First Aid Only

**ESTIMATED NUMBER OF DAYS AWAY FROM JOB:** \_\_\_\_\_

**NATURE OF INJURY OR ILLNESS:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**CLASSIFICATION OF INJURY:**

- |                    |                       |                            |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions      | _____ Dislocations    | _____ Punctures            |
| ___ Bites          | _____ Faint/Dizziness | _____ Radiation Burns      |
| ___ Blisters       | _____ Fractures       | _____ Respiratory Allergy  |
| ___ Bruises        | _____ Frostbite       | _____ Sprains              |
| ___ Chemical Burns | _____ Heat Burns      | _____ Toxic Resp. Exposure |
| ___ Cold Exposure  | _____ Heat Exhaustion | _____ Toxic Ingestion      |
| ___ Concussion     | _____ Heat Stroke     | _____ Dermal Allergy       |
| ___ Lacerations    |                       |                            |

Part of Body Affected: \_\_\_\_\_

Degree of Disability: \_\_\_\_\_

Date Medical Care was Received: \_\_\_\_\_

Where Medical Care was Received: \_\_\_\_\_

Address (if off-site): \_\_\_\_\_

(If two or more injuries, record on separate sheets)

**PROPERTY DAMAGE:**

Description of Damage: \_\_\_\_\_

Cost of Damage:                   \$ \_\_\_\_\_

**ACCIDENT/INCIDENT LOCATION:** \_\_\_\_\_

**ACCIDENT/INCIDENT ANALYSIS:** Causative agent most directly related to accident/incident  
(Object, substance, material, machinery, equipment, conditions)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Was weather a factor?: \_\_\_\_\_

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

\_\_\_\_\_  
\_\_\_\_\_

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

\_\_\_\_\_

**ON-SITE ACCIDENTS/INCIDENTS:**

Level of personal protection equipment required in Site Safety Plan:

\_\_\_\_\_  
\_\_\_\_\_

Modifications:

Was injured using required equipment?:

\_\_\_\_\_

If not, how did actual equipment use differ from plan?:

\_\_\_\_\_  
\_\_\_\_\_

**ACTION TAKEN TO PREVENT RECURRENCE:** (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

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**ACCIDENT/INCIDENT REPORT REVIEWED BY:**

\_\_\_\_\_  
SSO Name Printed

\_\_\_\_\_  
SSO Signature

**OTHERS PARTICIPATING IN INVESTIGATION:**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ACCIDENT/INCIDENT FOLLOW-UP:**      Date: \_\_\_\_\_

Outcome of accident/incident: \_\_\_\_\_

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Physician's recommendations: \_\_\_\_\_

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---

Date injured returned to work: \_\_\_\_\_

Follow-up performed by:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM**

**APPENDIX D**  
**EMERGENCY HAND SIGNALS**

## EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

### EMERGENCY HAND SIGNALS

**OUT OF AIR, CAN'T BREATHE!**



**Hand gripping throat**

**LEAVE AREA IMMEDIATELY,  
NO DEBATE!**

**(No Picture) Grip partner's wrist or place both hands around waist**

**NEED ASSISTANCE!**



**Hands on top of head**

**OKAY! – I'M ALL RIGHT!**

**- I UNDERSTAND!**



**Thumbs up**

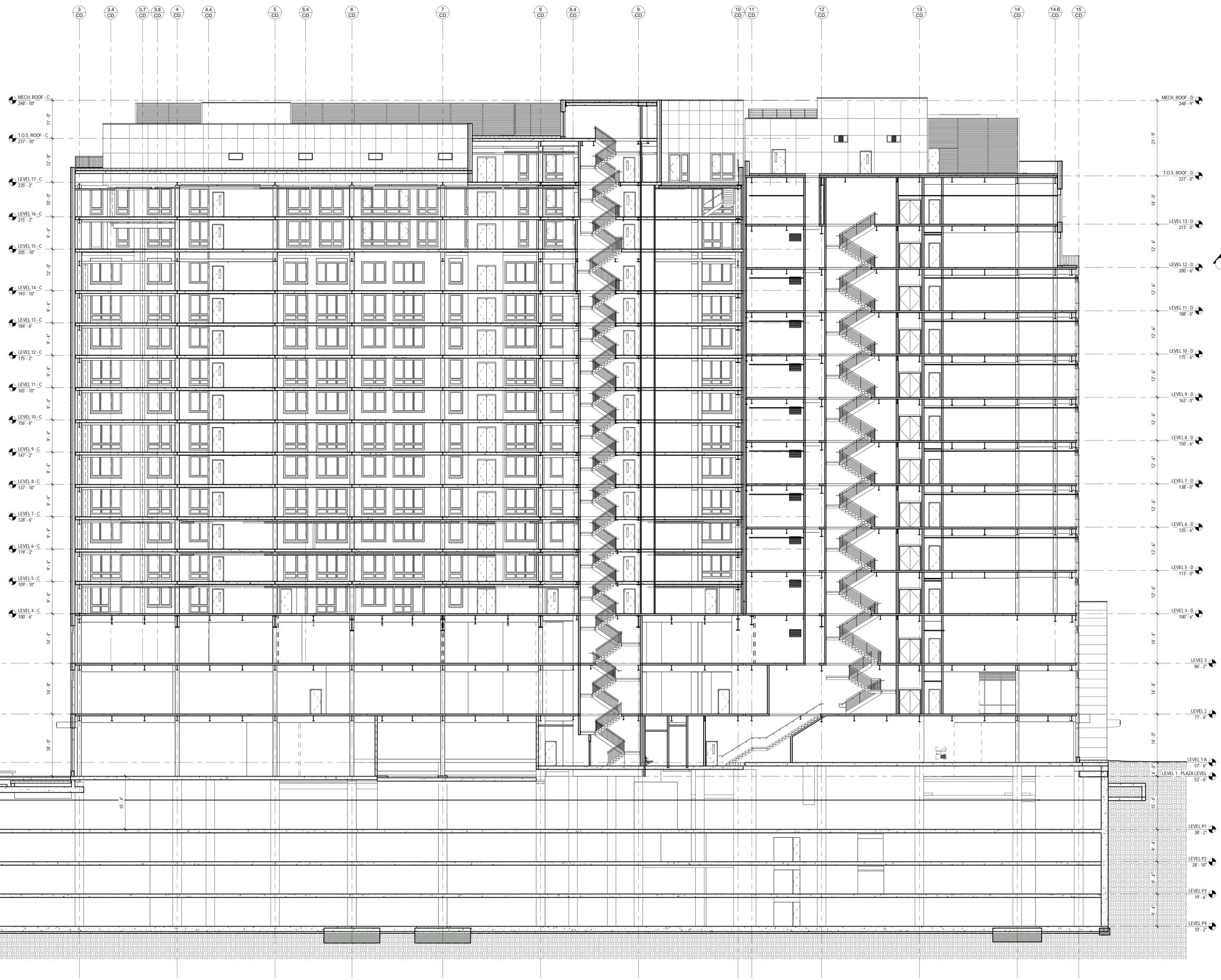
**NO! - NEGATIVE!**



**Thumbs down**

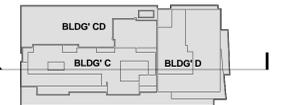
**Appendix B**  
**Architectural Plans**





c:\REVIT LOCAL\48660\_BLDG C&D - GARAGE & PODIUM\_1.mna.rvt  
 10/25/2013 5:28:38 PM

NO.	DATE	ISSUE
10-28-2013	DOB FILING - FOUNDATION PERMIT	
06-03-2013	100% DESIGN DEVELOPMENT	
04-10-2013	75% DD	



**Perkins Eastman**  
 115 FIFTH AVENUE  
 NEW YORK, NY 10003  
 T. 212.303.3200  
 F. 212.353.7676

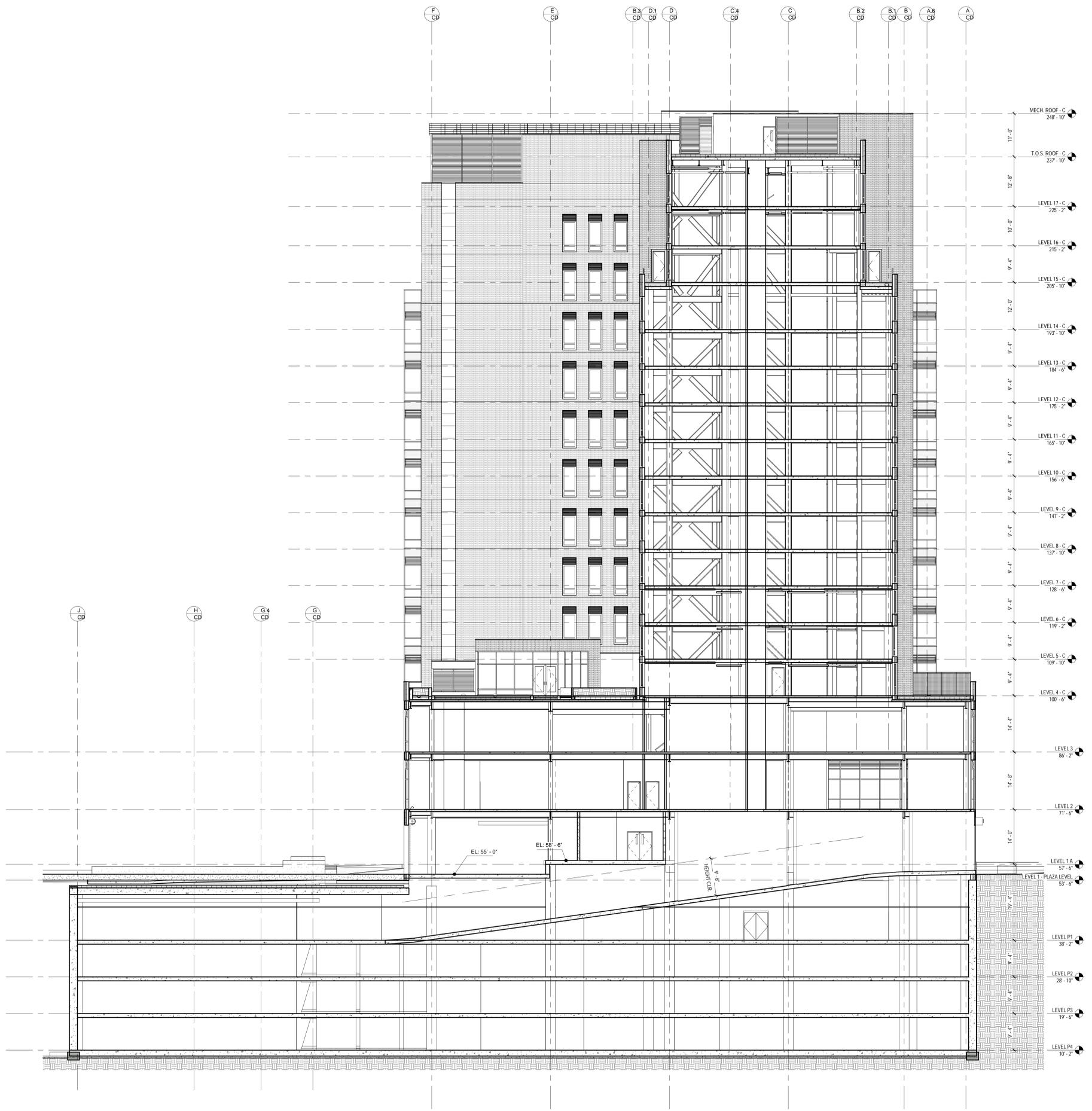
**Owner:**  
 FLUSHING COMMONS, LLC  
 1121 AVENUE OF THE AMERICAS, 29TH FL. NEW YORK, NY  
 (212) 282-2100  
**Construction Manager:**  
 TISHMAN CONSTRUCTION CORPORATION  
 666 FIFTH AVENUE NEW YORK, NY 10103  
 (212) 309-3650  
**Chil / Site:**  
 AKRF ENGINEERS, PC  
 PARK AVENUE SOUTH NEW YORK, NY 10016  
 (212) 696-0670  
**Structural Engineer:**  
 DESIMONE CONSULTING ENGINEERS  
 18 WEST 18TH STREET NEW YORK, NY 10003  
 (212) 532-2211  
**MEP-F Engineer:**  
 AKF ENGINEERS  
 1501 BROADWAY, SUITE 700 NEW YORK, NY  
 (212) 354-5556  
**Landscape Architect:**  
 THOMAS BALSLEY & ASSOCIATES  
 31 WEST 27TH STREET, 9TH FL. NEW YORK, NY  
 (212) 684-9230

**PROJECT TITLE:**  
 FLUSHING COMMONS  
 LOT 40  
**C&D**  
 38-18 Union Street  
 Flushing, NY 11354  
**PROJECT No:** 48660.00  
**DOB No:**  
**DRAWING TITLE:**  
 BUILDING SECTION  
 E-W 1

**SCALE:** As Indicated    **PAGE:**    **OF**  
**A-301.00**

DOB BSCAN STICKER

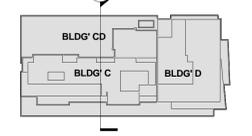
SEAL



1 BUILDING SECTION N/S 1  
3/12" = 1'-0"

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 10/25/2013 5:29:15 PM

NO.	DATE	ISSUE
10-28-2013	DOB FILING - FOUNDATION PERMIT	
06-03-2013	100% DESIGN DEVELOPMENT	
04-10-2013	75% DD	



**Perkins Eastman**  
 115 FIFTH AVENUE  
 NEW YORK, NY 10003  
 T. 212.303.7200  
 F. 212.353.7676

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 FLUSHING COMMONS, LLC  
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 AKRF ENGINEERS, PC  
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 (212) 696-0670

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 FLUSHING COMMONS  
 LOT 40  
**C&D**  
 38-18 Union Street  
 Flushing, NY 11354

**PROJECT No:** 48660.00  
**DOB No:**

**DRAWING TITLE:**  
 BUILDING SECTION  
 N-S 1

**SCALE:** As indicated    **PAGE:**    **OF**

**A-303.00**

DOB BSCAN STICKER

SEAL

**Appendix C**  
**Updated Summary Tables for 2006 Soil Results**

**Flushing Commons**  
**Flushing New York**  
**Subsurface Investigation**  
*Volatile Organic Compounds*

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-1 (0.5-2.5') 4/11/2006 L0605260-01 mg/kg	SS-1 (24-26') 4/11/2006 L0605260-02 mg/kg	SS-2 (0.5-2.5') 4/12/2006 L0605260-04 mg/kg	SS-2 (6-8') 4/12/2006 L0605260-05 mg/kg	SS-3 (0.5-2.5') 4/12/2006 L0605260-06 mg/kg	SS-3 (9-11') 4/12/2006 L0605260-07 mg/kg
Compound	mg/kg	mg/kg	mg/kg						
1,1,1,2-Tetrachloroethane	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
1,1,1-Trichloroethane	0.68	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
1,1,2-Trichloroethane	NS	NS	NS	0.0042 U	0.0041 U	0.0041 U	0.004 U	0.0041 U	0.0041 U
1,1-Dichloroethane	0.27	26	240	0.0042 U	0.0041 U	0.0041 U	0.004 U	0.0041 U	0.0041 U
1,1-Dichloroethene	0.33	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
1,1-Dichloropropene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2,3-Trichlorobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2,3-Trichloropropane	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2,4-Trimethylbenzene	3.6	52	190	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2-Dibromo-3-chloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2-Dibromoethane	NS	NS	NS	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
1,2-Dichlorobenzene	1.1	100	500	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,2-Dichloroethane	0.02	3.1	30	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
1,2-Dichloropropane	NS	NS	NS	0.0097 U	0.0096 U	0.0096 U	0.0093 U	0.0095 U	0.0096 U
1,3,5-Trimethylbenzene	8.4	52	190	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,3-Dichlorobenzene	2.4	49	280	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,3-Dichloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,4-Dichlorobenzene	1.8	13	130	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
1,4-Dichlorobutane	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
2,2-Dichloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
2-Butanone	0.12	100	500	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
2-Hexanone	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
4-Methyl-2-pentanone	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Acetone	0.05	100	500	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Acrolein	NS	NS	NS	0.069 U	0.069 U	0.069 U	0.066 U	0.068 U	0.069 U
Acrylonitrile	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Benzene	0.06	4.8	44	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Bromobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Bromochloromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Bromodichloromethane	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Bromoform	NS	NS	NS	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Bromomethane	NS	NS	NS	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
Carbon disulfide	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Carbon tetrachloride	0.76	2.4	22	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Chlorobenzene	1.1	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Chloroethane	NS	NS	NS	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
Chloroform	0.37	49	350	0.0042 U	0.0041 U	0.0041 U	0.004 U	0.0041 U	0.0041 U
Chloromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
cis-1,2-Dichloroethene	0.25	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
cis-1,3-Dichloropropene	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Dibromochloromethane	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Dibromomethane	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Dichlorodifluoromethane	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Ethyl ether	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Ethyl methacrylate	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Ethylbenzene	1	41	390	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Hexachlorobutadiene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Iodomethane	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Isopropylbenzene	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Methyl tert butyl ether	0.93	100	500	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
Methylene chloride	0.05	100	500	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
n-Butylbenzene	12	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
n-Propylbenzene	3.9	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Naphthalene	12	100	500	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
o-Chlorotoluene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
o-Xylene	0.26	100	500	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
p-Chlorotoluene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
p-Isopropyltoluene	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
p/m-Xylene	0.26	100	500	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
sec-Butylbenzene	11	100	500	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Styrene	NS	NS	NS	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U
tert-Butylbenzene	5.9	100	500	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Tetrachloroethene	1.3	19	150	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Tetrahydrofuran	NS	NS	NS	0.056 U	0.055 U	0.055 U	0.053 U	0.054 U	0.055 U
Toluene	0.7	100	500	0.0042 U	0.0041 U	0.0041 U	0.004 U	0.0041 U	0.0041 U
trans-1,2-Dichloroethene	0.19	100	500	0.0042 U	0.0041 U	0.0041 U	0.004 U	0.0041 U	0.0041 U
trans-1,3-Dichloropropene	NS	NS	NS	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
trans-1,4-Dichloro-2-butene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Trichloroethene	0.47	21	200	0.0028 U	0.0027 U	0.0027 U	0.0026 U	0.0027 U	0.0027 U
Trichlorofluoromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U
Vinyl acetate	NS	NS	NS	0.028 U	0.027 U	0.027 U	0.026 U	0.027 U	0.027 U
Vinyl chloride	0.02	0.9	13	0.0056 U	0.0055 U	0.0055 U	0.0053 U	0.0054 U	0.0055 U

**Flushing Commons**  
**Flushing New York**  
**Subsurface Investigation**  
*Volatile Organic Compounds*

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-4 (0.5-2.5') 4/11/2006 L0605260-08 mg/kg	SS-4 (42-44') 4/11/2006 L0605260-09 mg/kg	SS-5 (0.5-2.5') 4/12/2006 L0605260-11 mg/kg	SS-5 (5-7') 4/12/2006 L0605260-12 mg/kg	SS-6 (0.5-2.5') 4/12/2006 L0605260-13 mg/kg	SS-6 (18-20') 4/12/2006 L0605260-14 mg/kg
Compound	mg/kg	mg/kg	mg/kg						
1,1,1,2-Tetrachloroethane	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
1,1,1-Trichloroethane	0.68	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
1,1,2-Trichloroethane	NS	NS	NS	0.0042 U	0.0043 U	0.0042 U	0.0042 U	0.004 U	0.0039 U
1,1-Dichloroethane	0.27	26	240	0.0042 U	0.0043 U	0.0042 U	0.0042 U	0.004 U	0.0039 U
1,1-Dichloroethene	0.33	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
1,1-Dichloropropene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2,3-Trichlorobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2,3-Trichloropropane	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2,4-Trimethylbenzene	3.6	52	190	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2-Dibromo-3-chloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2-Dibromoethane	NS	NS	NS	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
1,2-Dichlorobenzene	1.1	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,2-Dichloroethane	0.02	3.1	30	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
1,2-Dichloropropane	NS	NS	NS	0.0097 U	0.0099 U	0.0097 U	0.0097 U	0.0094 U	0.0091 U
1,3,5-Trimethylbenzene	8.4	52	190	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,3-Dichlorobenzene	2.4	49	280	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,3-Dichloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,4-Dichlorobenzene	1.8	13	130	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
1,4-Dichlorobutane	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
2,2-Dichloropropane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
2-Butanone	0.12	100	500	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
2-Hexanone	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
4-Methyl-2-pentanone	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Acetone	0.05	100	500	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Acrolein	NS	NS	NS	0.069 U	0.071 U	0.069 U	0.069 U	0.067 U	0.065 U
Acrylonitrile	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Benzene	0.06	4.8	44	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Bromobenzene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Bromochloromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Bromodichloromethane	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Bromoform	NS	NS	NS	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
Bromomethane	NS	NS	NS	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
Carbon disulfide	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Carbon tetrachloride	0.76	2.4	22	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Chlorobenzene	1.1	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Chloroethane	NS	NS	NS	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
Chloroform	0.37	49	350	0.0042 U	0.0043 U	0.0042 U	0.0042 U	0.004 U	0.0039 U
Chloromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
cis-1,2-Dichloroethene	0.25	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
cis-1,3-Dichloropropene	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Dibromochloromethane	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Dibromomethane	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Dichlorodifluoromethane	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Ethyl ether	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Ethyl methacrylate	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Ethylbenzene	1	41	390	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Hexachlorobutadiene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Iodomethane	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Isopropylbenzene	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Methyl tert butyl ether	0.93	100	500	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
Methylene chloride	0.05	100	500	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
n-Butylbenzene	12	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
n-Propylbenzene	3.9	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Naphthalene	12	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
o-Chlorotoluene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
o-Xylene	0.26	100	500	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
p-Chlorotoluene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
p-Isopropyltoluene	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
p/m-Xylene	0.26	100	500	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
sec-Butylbenzene	11	100	500	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Styrene	NS	NS	NS	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U
tert-Butylbenzene	5.9	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Tetrachloroethene	1.3	19	150	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Tetrahydrofuran	NS	NS	NS	0.056 U	0.057 U	0.056 U	0.056 U	0.054 U	0.052 U
Toluene	0.7	100	500	0.0042 U	0.0043 U	0.0042 U	0.0042 U	0.004 U	0.0039 U
trans-1,2-Dichloroethene	0.19	100	500	0.0042 U	0.0043 U	0.0042 U	0.0042 U	0.004 U	0.0039 U
trans-1,3-Dichloropropene	NS	NS	NS	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
trans-1,4-Dichloro-2-butene	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Trichloroethene	0.47	21	200	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0027 U	0.0026 U
Trichlorofluoromethane	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U
Vinyl acetate	NS	NS	NS	0.028 U	0.028 U	0.028 U	0.028 U	0.027 U	0.026 U
Vinyl chloride	0.02	0.9	13	0.0056 U	0.0057 U	0.0056 U	0.0056 U	0.0054 U	0.0052 U

**Flushing Commons**  
**Flushing New York**  
**Subsurface Investigation**  
*Volatile Organic Compounds*

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-7 (0.5-2.0') 4/12/2006 L0605260-15 mg/kg	SS-7 (23-24') 4/12/2006 L0605260-16 mg/kg	SS-8 (0.5-2.5') 4/12/2006 L0605260-17 mg/kg	SS-8 (6-8') 4/12/2006 L0605260-18 mg/kg	SS-9 (0.5-3') 4/11/2006 L0605260-19 mg/kg	SS-9 (22-24') 4/11/2006 L0605260-20 mg/kg
Compound	mg/kg	mg/kg	mg/kg						
1,1,1,2-Tetrachloroethane	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
1,1,1-Trichloroethane	0.68	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
1,1,2-Trichloroethane	NS	NS	NS	0.0041 U	0.0039 U	0.0038 U	0.0041 U	0.0042 U	0.0038 U
1,1-Dichloroethane	0.27	26	240	0.0041 U	0.0039 U	0.0038 U	0.0041 U	0.0042 U	0.0038 U
1,1-Dichloroethene	0.33	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
1,1-Dichloropropene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2,3-Trichlorobenzene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2,3-Trichloropropane	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2,4-Trimethylbenzene	3.6	52	190	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2-Dibromo-3-chloropropane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2-Dibromoethane	NS	NS	NS	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U
1,2-Dichlorobenzene	1.1	100	500	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,2-Dichloroethane	0.02	3.1	30	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
1,2-Dichloropropane	NS	NS	NS	0.0095 U	0.009 U	0.0089 U	0.0095 U	0.0097 U	0.0089 U
1,3,5-Trimethylbenzene	8.4	52	190	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,3-Dichlorobenzene	2.4	49	280	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,3-Dichloropropane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,4-Dichlorobenzene	1.8	13	130	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
1,4-Dichlorobutane	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
2,2-Dichloropropane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
2-Butanone	0.12	100	500	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
2-Hexanone	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
4-Methyl-2-pentanone	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Acetone	0.05	100	500	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Acrolein	NS	NS	NS	0.068 U	0.064 U	0.064 U	0.068 U	0.069 U	0.064 U
Acrylonitrile	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Benzene	0.06	4.8	44	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Bromobenzene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Bromochloromethane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Bromodichloromethane	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Bromoform	NS	NS	NS	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U
Bromomethane	NS	NS	NS	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
Carbon disulfide	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Carbon tetrachloride	0.76	2.4	22	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Chlorobenzene	1.1	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Chloroethane	NS	NS	NS	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
Chloroform	0.37	49	350	0.0041 U	0.0039 U	0.0038 U	0.0041 U	0.0042 U	0.0038 U
Chloromethane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
cis-1,2-Dichloroethene	0.25	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
cis-1,3-Dichloropropene	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Dibromochloromethane	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Dibromomethane	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Dichlorodifluoromethane	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Ethyl ether	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Ethyl methacrylate	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Ethylbenzene	1	41	390	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Hexachlorobutadiene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Iodomethane	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Isopropylbenzene	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Methyl tert butyl ether	0.93	100	500	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
Methylene chloride	0.05	100	500	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
n-Butylbenzene	12	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
n-Propylbenzene	3.9	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Naphthalene	12	100	500	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
o-Chlorotoluene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
o-Xylene	0.26	100	500	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
p-Chlorotoluene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
p-Isopropyltoluene	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
p/m-Xylene	0.26	100	500	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
sec-Butylbenzene	11	100	500	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Styrene	NS	NS	NS	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U
tert-Butylbenzene	5.9	100	500	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Tetrachloroethene	1.3	19	150	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Tetrahydrofuran	NS	NS	NS	0.054 U	0.052 U	0.051 U	0.054 U	0.056 U	0.051 U
Toluene	0.7	100	500	0.0041 U	0.0039 U	0.0038 U	0.0041 U	0.0042 U	0.0038 U
trans-1,2-Dichloroethene	0.19	100	500	0.0041 U	0.0039 U	0.0038 U	0.0041 U	0.0042 U	0.0038 U
trans-1,3-Dichloropropene	NS	NS	NS	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
trans-1,4-Dichloro-2-butene	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Trichloroethene	0.47	21	200	0.0027 U	0.0026 U	0.0026 U	0.0027 U	0.0028 U	0.0026 U
Trichlorofluoromethane	NS	NS	NS	0.014 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U
Vinyl acetate	NS	NS	NS	0.027 U	0.026 U	0.026 U	0.027 U	0.028 U	0.026 U
Vinyl chloride	0.02	0.9	13	0.0054 U	0.0052 U	0.0051 U	0.0054 U	0.0056 U	0.0051 U

**Flushing Commons**  
**Flushing New York**  
**Subsurface Investigation**  
*Volatile Organic Compounds*

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-10 (0.5-2.5') 4/12/2006 L0605260-22 mg/kg	SS-10 (6-8') 4/12/2006 L0605260-23 mg/kg	SS-11 (0.5-2.5') 4/12/2006 L0605260-24 mg/kg	SS-11 (10-11') 4/12/2006 L0605260-25 mg/kg
Compound	mg/kg	mg/kg	mg/kg				
1,1,1,2-Tetrachloroethane	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
1,1,1-Trichloroethane	0.68	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
1,1,2-Trichloroethane	NS	NS	NS	0.0039 U	0.0039 U	0.0039 U	0.004 U
1,1-Dichloroethane	0.27	26	240	0.0039 U	0.0039 U	0.0039 U	0.004 U
1,1-Dichloroethene	0.33	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
1,1-Dichloropropene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
1,2,3-Trichlorobenzene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
1,2,3-Trichloropropane	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
1,2,4-Trimethylbenzene	3.6	52	190	0.013 U	0.013 U	0.013 U	0.013 U
1,2-Dibromo-3-chloropropane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
1,2-Dibromoethane	NS	NS	NS	0.01 U	0.01 U	0.01 U	0.011 U
1,2-Dichlorobenzene	1.1	100	500	0.013 U	0.013 U	0.013 U	0.013 U
1,2-Dichloroethane	0.02	3.1	30	0.0026 U	0.0026 U	0.0026 U	0.0026 U
1,2-Dichloropropane	NS	NS	NS	0.0092 U	0.0092 U	0.009 U	0.0093 U
1,3,5-Trimethylbenzene	8.4	52	190	0.013 U	0.013 U	0.013 U	0.013 U
1,3-Dichlorobenzene	2.4	49	280	0.013 U	0.013 U	0.013 U	0.013 U
1,3-Dichloropropane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
1,4-Dichlorobenzene	1.8	13	130	0.013 U	0.013 U	0.013 U	0.013 U
1,4-Dichlorobutane	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
2,2-Dichloropropane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
2-Butanone	0.12	100	500	0.026 U	0.026 U	0.026 U	0.026 U
2-Hexanone	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
4-Methyl-2-pentanone	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Acetone	0.05	100	500	0.026 U	0.026 U	0.026 U	0.026 U
Acrolein	NS	NS	NS	0.066 U	0.066 U	0.064 U	0.066 U
Acrylonitrile	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Benzene	0.06	4.8	44	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Bromobenzene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Bromochloromethane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Bromodichloromethane	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Bromoform	NS	NS	NS	0.01 U	0.01 U	0.01 U	0.011 U
Bromomethane	NS	NS	NS	0.0053 U	0.0053 U	0.0052 U	0.0053 U
Carbon disulfide	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Carbon tetrachloride	0.76	2.4	22	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Chlorobenzene	1.1	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Chloroethane	NS	NS	NS	0.0053 U	0.0053 U	0.0052 U	0.0053 U
Chloroform	0.37	49	350	0.0039 U	0.0039 U	0.0039 U	0.004 U
Chloromethane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
cis-1,2-Dichloroethene	0.25	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
cis-1,3-Dichloropropene	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Dibromochloromethane	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Dibromomethane	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Dichlorodifluoromethane	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Ethyl ether	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Ethyl methacrylate	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Ethylbenzene	1	41	390	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Hexachlorobutadiene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Iodomethane	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Isopropylbenzene	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Methyl tert butyl ether	0.93	100	500	0.0053 U	0.0053 U	0.0052 U	0.0053 U
Methylene chloride	0.05	100	500	0.026 U	0.026 U	0.026 U	0.026 U
n-Butylbenzene	12	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
n-Propylbenzene	3.9	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Naphthalene	12	100	500	0.013 U	0.013 U	0.013 U	0.013 U
o-Chlorotoluene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
o-Xylene	0.26	100	500	0.0053 U	0.0053 U	0.0052 U	0.0053 U
p-Chlorotoluene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
p-Isopropyltoluene	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
p/m-Xylene	0.26	100	500	0.0053 U	0.0053 U	0.0052 U	0.0053 U
sec-Butylbenzene	11	100	500	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Styrene	NS	NS	NS	0.0053 U	0.0053 U	0.0052 U	0.0053 U
tert-Butylbenzene	5.9	100	500	0.013 U	0.013 U	0.013 U	0.013 U
Tetrachloroethene	1.3	19	150	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Tetrahydrofuran	NS	NS	NS	0.053 U	0.053 U	0.052 U	0.053 U
Toluene	0.7	100	500	0.0039 U	0.0039 U	0.0039 U	0.004 U
trans-1,2-Dichloroethene	0.19	100	500	0.0039 U	0.0039 U	0.0039 U	0.004 U
trans-1,3-Dichloropropene	NS	NS	NS	0.0026 U	0.0026 U	0.0026 U	0.0026 U
trans-1,4-Dichloro-2-butene	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Trichloroethene	0.47	21	200	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Trichlorofluoromethane	NS	NS	NS	0.013 U	0.013 U	0.013 U	0.013 U
Vinyl acetate	NS	NS	NS	0.026 U	0.026 U	0.026 U	0.026 U
Vinyl chloride	0.02	0.9	13	0.0053 U	0.0053 U	0.0052 U	0.0053 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
Semi-Volatile Organic Compounds**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-1 (0.5-2.5') 4/11/2006 L0605260-01 mg/kg	SS-1 (24-26') 4/11/2006 L0605260-02 mg/kg	SS-2 (0.5-2.5') 4/12/2006 L0605260-04 mg/kg	SS-2 (6-8') 4/12/2006 L0605260-05 mg/kg	SS-3 (0.5-2.5') 4/12/2006 L0605260-06 mg/kg	SS-3 (9-11') 4/12/2006 L0605260-07 mg/kg
1,2,4,5-Tetrachlorobenzene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1,2-Dichlorobenzene	1.1	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1,3-Dichlorobenzene	2.4	49	280	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1,4-Dichlorobenzene	1.8	13	130	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1-Chloronaphthalene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1-Methylnaphthalene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
1-Methylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
1-Methylphenanthrene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
2,4,5-Trichlorophenol	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2,4,6-Trichlorophenol	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2,4-Dichlorophenol	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
2,4-Dimethylphenol	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2,4-Dinitrophenol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
2,4-Dinitrotoluene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2,6-Dichlorophenol	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
2,6-Dimethylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
2,6-Dinitrotoluene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2-Chloronaphthalene	NS	NS	NS	0.44 U	0.44 U	0.44 U	0.42 U	0.43 U	0.44 U
2-Chloronaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
2-Chlorophenol	NS	NS	NS	0.44 U	0.44 U	0.44 U	0.42 U	0.43 U	0.44 U
2-Methylnaphthalene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2-Methylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
2-Methylphenol	0.33	100	500	0.44 U	0.44 U	0.44 U	0.42 U	0.43 U	0.44 U
2-Nitroaniline	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
2-Nitrophenol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
2-Picoline	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
3,3'-Dichlorobenzidine	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
3-Methylcholanthrene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
3-Methylphenol/4-Methylphenol	0.33	100	500	0.44 U	0.44 U	0.44 U	0.42 U	0.43 U	0.44 U
3-Nitroaniline	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
4,6-Dinitro-o-cresol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
4-Aminobiphenyl	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
4-Bromophenyl phenyl ether	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
4-Chloroaniline	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
4-Chlorophenyl phenyl ether	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
4-Nitroaniline	NS	NS	NS	0.52 U	0.51 U	0.51 U	0.5 U	0.51 U	0.51 U
4-Nitrophenol	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
7,12-Dimethylbenz(a)anthracene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
a,a-Dimethylphenethylamine	NS	NS	NS	3.7 U	3.7 U	3.7 U	3.5 U	3.6 U	3.7 U
Acenaphthene	20	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Acenaphthene*	20	100	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Acenaphthylene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Acenaphthylene*	100	100	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Acetophenone	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
a-Naphthylamine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Aniline	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Anthracene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Anthracene*	100	100	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Azobenzene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzidine	NS	NS	NS	3.7 U	3.7 U	3.7 U	3.5 U	3.6 U	3.7 U
Benzo(a)anthracene	1	1	5.6	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(a)anthracene*	1	1	5.6	0.015 U	0.015 U	0.048	0.014 U	0.014 U	0.015 U
Benzo(a)pyrene	1	1	1	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(a)pyrene*	1	1	1	0.015 U	0.018	0.06	0.014 U	0.014 U	0.015 U
Benzo(b)fluoranthene	1	1	5.6	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(b)fluoranthene*	1	1	5.6	0.015 U	0.025	0.069	0.014 U	0.014 U	0.015 U
Benzo(c)pyrene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(c)Pyrene*	NS	NS	NS	0.015 U	0.017	0.041	0.014 U	0.014 U	0.015 U
Benzo(ghi)perylene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(ghi)perylene*	100	100	500	0.015 U	0.015 U	0.037	0.014 U	0.014 U	0.015 U
Benzo(k)fluoranthene	0.8	3.9	56	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Benzo(k)fluoranthene*	0.8	3.9	56	0.015 U	0.016	0.043	0.014 U	0.014 U	0.015 U
Benzoic Acid	NS	NS	NS	3.7 U	3.7 U	3.7 U	3.5 U	3.6 U	3.7 U
Benzyl Alcohol	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Biphenyl	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Biphenyl*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Bis(2-chloroethoxy)methane	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Bis(2-chloroethyl)ether	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Bis(2-chloroisopropyl)ether	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Bis(2-ethylhexyl)phthalate	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
b-Naphthylamine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Butyl benzyl phthalate	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Carbazole	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Chlorobenzilate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U

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LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-1 (0.5-2.5') 4/11/2006 L0605260-01 mg/kg	SS-1 (24-26') 4/11/2006 L0605260-02 mg/kg	SS-2 (0.5-2.5') 4/12/2006 L0605260-04 mg/kg	SS-2 (6-8') 4/12/2006 L0605260-05 mg/kg	SS-3 (0.5-2.5') 4/12/2006 L0605260-06 mg/kg	SS-3 (9-11') 4/12/2006 L0605260-07 mg/kg
Chrysene	1	3.9	56	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Chrysene*	1	3.9	56	0.015 U	0.015 U	0.043	0.014 U	0.014 U	0.015 U
Dibenzo(a,h)anthracene	0.33	0.33	0.56	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Dibenzo(a,h)anthracene*	0.33	0.33	0.56	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Dibenzofuran	7	59	350	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Diethyl phthalate	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Dimethoate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Dimethyl phthalate	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Di-n-butylphthalate	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Di-n-octylphthalate	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Ethyl Methanesulfonate	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Fluoranthene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Fluoranthene*	100	100	500	0.015 U	0.015 U	0.079	0.014 U	0.014 U	0.015 U
Fluorene	30	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Fluorene*	30	100	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Hexachlorobenzene	0.33	1.2	6	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Hexachlorobenzene*	0.33	1.2	6	0.059 U	0.059 U	0.059 U	0.057 U	0.058 U	0.059 U
Hexachlorobutadiene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Hexachlorobutadiene*	NS	NS	NS	0.037 U	0.037 U	0.037 U	0.035 U	0.036 U	0.037 U
Hexachlorocyclopentadiene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Hexachloroethane	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Hexachloroethane*	NS	NS	NS	0.059 U	0.059 U	0.059 U	0.057 U	0.058 U	0.059 U
Hexachloropropene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Indeno(1,2,3-cd)pyrene	0.5	0.5	5.6	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Indeno(1,2,3-cd)Pyrene*	0.5	0.5	5.6	0.015 U	0.015 U	0.034	0.014 U	0.014 U	0.015 U
Isodrin	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Isophorone	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Methyl methanesulfonate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Naphthalene	12	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Naphthalene*	12	100	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
NDPA/DPA	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Nitrobenzene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Nitrosodi-n-butylamine	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Nitrosodipiperidine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
n-Nitrosodimethylamine	NS	NS	NS	3.7 U	3.7 U	3.7 U	3.5 U	3.6 U	3.7 U
n-Nitrosodi-n-propylamine	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
p-Chloro-m-cresol	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
p-Dimethylaminoazobenzene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Pentachlorobenzene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Pentachloronitrobenzene	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Pentachlorophenol	0.8	6.7	6.7	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Pentachlorophenol*	0.8	6.7	6.7	0.059 U	0.059 U	0.059 U	0.057 U	0.058 U	0.059 U
Perylene	NS	NS	NS	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Perylene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U
Phenacetin	NS	NS	NS	0.74 U	0.73 U	0.73 U	0.71 U	0.72 U	0.73 U
Phenanthrene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Phenanthrene*	100	100	500	0.015 U	0.015 U	0.024	0.014 U	0.014 U	0.015 U
Phenol	0.33	100	500	0.52 U	0.51 U	0.51 U	0.5 U	0.51 U	0.51 U
Pronamide	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U	1.5 U
Pyrene	100	100	500	0.37 U	0.37 U	0.37 U	0.35 U	0.36 U	0.37 U
Pyrene*	100	100	500	0.015 U	0.015 U	0.066	0.014 U	0.014 U	0.015 U
Pyridine	NS	NS	NS	3.7 U	3.7 U	3.7 U	3.5 U	3.6 U	3.7 U

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LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-4 (0.5-2.5') 4/11/2006 L0605260-08 mg/kg	SS-4 (42-44') 4/11/2006 L0605260-09 mg/kg	SS-5 (0.5-2.5') 4/12/2006 L0605260-11 mg/kg	SS-5 (5-7') 4/12/2006 L0605260-12 mg/kg	SS-6 (0.5-2.5') 4/12/2006 L0605260-13 mg/kg	SS-6 (18-20') 4/12/2006 L0605260-14 mg/kg
1,2,4,5-Tetrachlorobenzene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1,2-Dichlorobenzene	1.1	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1,3-Dichlorobenzene	2.4	49	280	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1,4-Dichlorobenzene	1.8	13	130	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1-Chloronaphthalene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1-Methylnaphthalene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
1-Methylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
1-Methylphenanthrene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
2,4,5-Trichlorophenol	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2,4,6-Trichlorophenol	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2,4-Dichlorophenol	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
2,4-Dimethylphenol	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2,4-Dinitrophenol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
2,4-Dinitrotoluene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2,6-Dichlorophenol	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
2,6-Dimethylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
2,6-Dinitrotoluene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2-Chloronaphthalene	NS	NS	NS	0.44 U	0.45 U	0.44 U	0.44 U	0.43 U	0.42 U
2-Chloronaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
2-Chlorophenol	NS	NS	NS	0.44 U	0.45 U	0.44 U	0.44 U	0.43 U	0.42 U
2-Methylnaphthalene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2-Methylnaphthalene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
2-Methylphenol	0.33	100	500	0.44 U	0.45 U	0.44 U	0.44 U	0.43 U	0.42 U
2-Nitroaniline	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
2-Nitrophenol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
2-Picoline	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
3,3'-Dichlorobenzidine	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
3-Methylcholanthrene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
3-Methylphenol/4-Methylphenol	0.33	100	500	0.44 U	0.45 U	0.44 U	0.44 U	0.43 U	0.42 U
3-Nitroaniline	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
4,6-Dinitro-o-cresol	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
4-Aminobiphenyl	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
4-Bromophenyl phenyl ether	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
4-Chloroaniline	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
4-Chlorophenyl phenyl ether	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
4-Nitroaniline	NS	NS	NS	0.52 U	0.53 U	0.52 U	0.52 U	0.5 U	0.49 U
4-Nitrophenol	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
7,12-Dimethylbenz(a)anthracene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
a,a-Dimethylphenethylamine	NS	NS	NS	3.7 U	3.8 U	3.7 U	3.7 U	3.6 U	3.5 U
Acenaphthene	20	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Acenaphthene*	20	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Acenaphthylene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Acenaphthylene*	100	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Acetophenone	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
a-Naphthylamine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Aniline	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Anthracene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Anthracene*	100	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Azobenzene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzidine	NS	NS	NS	3.7 U	3.8 U	3.7 U	3.7 U	3.6 U	3.5 U
Benzo(a)anthracene	1	1	5.6	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(a)anthracene*	1	1	5.6	0.015 U	0.015 U	0.035	0.015 U	0.014 U	0.014 U
Benzo(a)pyrene	1	1	1	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(a)pyrene*	1	1	1	0.015 U	0.015 U	0.036	0.015 U	0.014 U	0.014 U
Benzo(b)fluoranthene	1	1	5.6	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(b)fluoranthene*	1	1	5.6	0.015 U	0.015 U	0.03	0.015 U	0.014 U	0.014 U
Benzo(c)pyrene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(c)Pyrene*	NS	NS	NS	0.015 U	0.015 U	0.024	0.015 U	0.014 U	0.014 U
Benzo(ghi)perylene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(ghi)perylene*	100	100	500	0.015 U	0.015 U	0.021	0.015 U	0.014 U	0.014 U
Benzo(k)fluoranthene	0.8	3.9	56	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Benzo(k)fluoranthene*	0.8	3.9	56	0.015 U	0.015 U	0.025	0.015 U	0.014 U	0.014 U
Benzoic Acid	NS	NS	NS	3.7 U	3.8 U	3.7 U	3.7 U	3.6 U	3.5 U
Benzyl Alcohol	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Biphenyl	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Biphenyl*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Bis(2-chloroethoxy)methane	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Bis(2-chloroethyl)ether	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Bis(2-chloroisopropyl)ether	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Bis(2-ethylhexyl)phthalate	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
b-Naphthylamine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Butyl benzyl phthalate	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Carbazole	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Chlorobenzilate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
Semi-Volatile Organic Compounds**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-4 (0.5-2.5') 4/11/2006 L0605260-08 mg/kg	SS-4 (42-44') 4/11/2006 L0605260-09 mg/kg	SS-5 (0.5-2.5') 4/12/2006 L0605260-11 mg/kg	SS-5 (5-7') 4/12/2006 L0605260-12 mg/kg	SS-6 (0.5-2.5') 4/12/2006 L0605260-13 mg/kg	SS-6 (18-20') 4/12/2006 L0605260-14 mg/kg
Chrysene	1	3.9	56	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Chrysene*	1	3.9	56	0.015 U	0.015 U	0.029	0.015 U	0.014 U	0.014 U
Dibenzo(a,h)anthracene	0.33	0.33	0.56	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Dibenzo(a,h)anthracene*	0.33	0.33	0.56	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Dibenzofuran	7	59	350	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Diethyl phthalate	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Dimethoate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Dimethyl phthalate	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Di-n-butylphthalate	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Di-n-octylphthalate	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Ethyl Methanesulfonate	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1 U
Fluoranthene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Fluoranthene*	100	100	500	0.015 U	0.015 U	0.04	0.015 U	0.014 U	0.014 U
Fluorene	30	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Fluorene*	30	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Hexachlorobenzene	0.33	1.2	6	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Hexachlorobenzene*	0.33	1.2	6	0.059 U	0.061 U	0.059 U	0.059 U	0.057 U	0.056 U
Hexachlorobutadiene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Hexachlorobutadiene*	NS	NS	NS	0.037 U	0.038 U	0.037 U	0.037 U	0.036 U	0.035 U
Hexachlorocyclopentadiene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Hexachloroethane	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Hexachloroethane*	NS	NS	NS	0.059 U	0.061 U	0.059 U	0.059 U	0.057 U	0.056 U
Hexachloropropene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Indeno(1,2,3-cd)pyrene	0.5	0.5	5.6	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Indeno(1,2,3-cd)Pyrene*	0.5	0.5	5.6	0.015 U	0.015 U	0.018	0.015 U	0.014 U	0.014 U
Isodrin	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Isophorone	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Methyl methanesulfonate	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Naphthalene	12	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Naphthalene*	12	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
NDPA/DPA	NS	NS	NS	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1 U
Nitrobenzene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Nitrosodi-n-butylamine	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Nitrosodipiperidine	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
n-Nitrosodimethylamine	NS	NS	NS	3.7 U	3.8 U	3.7 U	3.7 U	3.6 U	3.5 U
n-Nitrosodi-n-propylamine	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
p-Chloro-m-cresol	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
p-Dimethylaminoazobenzene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Pentachlorobenzene	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Pentachloronitrobenzene	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Pentachlorophenol	0.8	6.7	6.7	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Pentachlorophenol*	0.8	6.7	6.7	0.059 U	0.061 U	0.059 U	0.059 U	0.057 U	0.056 U
Perylene	NS	NS	NS	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Perylene*	NS	NS	NS	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Phenacetin	NS	NS	NS	0.74 U	0.76 U	0.74 U	0.74 U	0.72 U	0.69 U
Phenanthrene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Phenanthrene*	100	100	500	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Phenol	0.33	100	500	0.52 U	0.53 U	0.52 U	0.52 U	0.5 U	0.49 U
Pronamide	NS	NS	NS	1.5 U	1.5 U	1.5 U	1.5 U	1.4 U	1.4 U
Pyrene	100	100	500	0.37 U	0.38 U	0.37 U	0.37 U	0.36 U	0.35 U
Pyrene*	100	100	500	0.015 U	0.015 U	0.037	0.015 U	0.014 U	0.014 U
Pyridine	NS	NS	NS	3.7 U	3.8 U	3.7 U	3.7 U	3.6 U	3.5 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
Semi-Volatile Organic Compounds**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-7 (0.5-2.0') 4/12/2006 L0605260-15 mg/kg	SS-7 (23-24') 4/12/2006 L0605260-16 mg/kg	SS-8 (0.5-2.5') 4/12/2006 L0605260-17 mg/kg	SS-8 (6-8') 4/12/2006 L0605260-18 mg/kg	SS-9 (0.5-3') 4/11/2006 L0605260-19 mg/kg	SS-9 (22-24') 4/11/2006 L0605260-20 mg/kg
1,2,4,5-Tetrachlorobenzene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1,2-Dichlorobenzene	1.1	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1,3-Dichlorobenzene	2.4	49	280	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1,4-Dichlorobenzene	1.8	13	130	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1-Chloronaphthalene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1-Methylnaphthalene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
1-Methylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
1-Methylphenanthrene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
2,4,5-Trichlorophenol	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2,4,6-Trichlorophenol	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2,4-Dichlorophenol	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
2,4-Dimethylphenol	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2,4-Dinitrophenol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
2,4-Dinitrotoluene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2,6-Dichlorophenol	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
2,6-Dimethylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
2,6-Dinitrotoluene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2-Chloronaphthalene	NS	NS	NS	0.43 U	0.41 U	0.41 U	0.43 U	0.44 U	0.41 U
2-Chloronaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
2-Chlorophenol	NS	NS	NS	0.43 U	0.41 U	0.41 U	0.43 U	0.44 U	0.41 U
2-Methylnaphthalene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2-Methylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
2-Methylphenol	0.33	100	500	0.43 U	0.41 U	0.41 U	0.43 U	0.44 U	0.41 U
2-Nitroaniline	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
2-Nitrophenol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
2-Picoline	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
3,3'-Dichlorobenzidine	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
3-Methylcholanthrene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
3-Methylphenol/4-Methylphenol	0.33	100	500	0.43 U	0.41 U	0.41 U	0.43 U	0.44 U	0.41 U
3-Nitroaniline	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
4,6-Dinitro-o-cresol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
4-Aminobiphenyl	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
4-Bromophenyl phenyl ether	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
4-Chloroaniline	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
4-Chlorophenyl phenyl ether	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
4-Nitroaniline	NS	NS	NS	0.51 U	0.48 U	0.48 U	0.51 U	0.52 U	0.48 U
4-Nitrophenol	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
7,12-Dimethylbenz(a)anthracene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
a,a-Dimethylphenethylamine	NS	NS	NS	3.6 U	3.4 U	3.4 U	3.6 U	3.7 U	3.4 U
Acenaphthene	20	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Acenaphthene*	20	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Acenaphthylene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Acenaphthylene*	100	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Acetophenone	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
a-Naphthylamine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Aniline	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Anthracene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Anthracene*	100	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Azobenzene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzidine	NS	NS	NS	3.6 U	3.4 U	3.4 U	3.6 U	3.7 U	3.4 U
Benzo(a)anthracene	1	1	5.6	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(a)anthracene*	1	1	5.6	0.014 U	0.02	0.014 U	0.014 U	0.015 U	0.014 U
Benzo(a)pyrene	1	1	1	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(a)pyrene*	1	1	1	0.021	0.037	0.014 U	0.014 U	0.015 U	0.014 U
Benzo(b)fluoranthene	1	1	5.6	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(b)fluoranthene*	1	1	5.6	0.022	0.03	0.014 U	0.014 U	0.015 U	0.014 U
Benzo(c)pyrene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(c)Pyrene*	NS	NS	NS	0.014 U	0.046	0.014 U	0.014 U	0.015 U	0.014 U
Benzo(ghi)perylene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(ghi)perylene*	100	100	500	0.014 U	0.029	0.014 U	0.014 U	0.015 U	0.014 U
Benzo(k)fluoranthene	0.8	3.9	56	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Benzo(k)fluoranthene*	0.8	3.9	56	0.016	0.019	0.014 U	0.014 U	0.015 U	0.014 U
Benzoic Acid	NS	NS	NS	3.6 U	3.4 U	3.4 U	3.6 U	3.7 U	3.4 U
Benzyl Alcohol	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Biphenyl	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Biphenyl*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Bis(2-chloroethoxy)methane	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Bis(2-chloroethyl)ether	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Bis(2-chloroisopropyl)ether	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Bis(2-ethylhexyl)phthalate	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
b-Naphthylamine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Butyl benzyl phthalate	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Carbazole	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Chlorobenzilate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation**  
Semi-Volatile Organic Compounds

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-7 (0.5-2.0') 4/12/2006 L0605260-15 mg/kg	SS-7 (23-24') 4/12/2006 L0605260-16 mg/kg	SS-8 (0.5-2.5') 4/12/2006 L0605260-17 mg/kg	SS-8 (6-8') 4/12/2006 L0605260-18 mg/kg	SS-9 (0.5-3') 4/11/2006 L0605260-19 mg/kg	SS-9 (22-24') 4/11/2006 L0605260-20 mg/kg
	mg/kg	mg/kg	mg/kg						
Chrysene	1	3.9	56	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Chrysene*	1	3.9	56	0.014 U	0.034	0.014 U	0.014 U	0.015 U	0.014 U
Dibenzo(a,h)anthracene	0.33	0.33	0.56	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Dibenzo(a,h)anthracene*	0.33	0.33	0.56	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Dibenzofuran	7	59	350	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Diethyl phthalate	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Dimethoate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Dimethyl phthalate	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Di-n-butylphthalate	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Di-n-octylphthalate	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Ethyl Methanesulfonate	NS	NS	NS	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
Fluoranthene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Fluoranthene*	100	100	500	0.018	0.037	0.014	0.014 U	0.015 U	0.014 U
Fluorene	30	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Fluorene*	30	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Hexachlorobenzene	0.33	1.2	6	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Hexachlorobenzene*	0.33	1.2	6	0.058 U	0.055 U	0.054 U	0.058 U	0.059 U	0.054 U
Hexachlorobutadiene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Hexachlorobutadiene*	NS	NS	NS	0.036 U	0.034 U	0.034 U	0.036 U	0.037 U	0.034 U
Hexachlorocyclopentadiene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Hexachloroethane	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Hexachloroethane*	NS	NS	NS	0.058 U	0.055 U	0.054 U	0.058 U	0.059 U	0.054 U
Hexachloropropene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Indeno(1,2,3-cd)pyrene	0.5	0.5	5.6	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Indeno(1,2,3-cd)Pyrene*	0.5	0.5	5.6	0.014 U	0.018	0.014 U	0.014 U	0.015 U	0.014 U
Isodrin	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Isophorone	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Methyl methanesulfonate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Naphthalene	12	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Naphthalene*	12	100	500	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
NDPA/DPA	NS	NS	NS	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
Nitrobenzene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Nitrosodi-n-butylamine	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Nitrosodipiperidine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
n-Nitrosodimethylamine	NS	NS	NS	3.6 U	3.4 U	3.4 U	3.6 U	3.7 U	3.4 U
n-Nitrosodi-n-propylamine	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
p-Chloro-m-cresol	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
p-Dimethylaminoazobenzene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Pentachlorobenzene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Pentachloronitrobenzene	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Pentachlorophenol	0.8	6.7	6.7	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Pentachlorophenol*	0.8	6.7	6.7	0.058 U	0.055 U	0.054 U	0.058 U	0.059 U	0.054 U
Perylene	NS	NS	NS	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Perylene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Phenacetin	NS	NS	NS	0.72 U	0.69 U	0.68 U	0.72 U	0.74 U	0.68 U
Phenanthrene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Phenanthrene*	100	100	500	0.014 U	0.022	0.014 U	0.014 U	0.015 U	0.014 U
Phenol	0.33	100	500	0.51 U	0.48 U	0.48 U	0.51 U	0.52 U	0.48 U
Pronamide	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U
Pyrene	100	100	500	0.36 U	0.34 U	0.34 U	0.36 U	0.37 U	0.34 U
Pyrene*	100	100	500	0.016	0.033	0.014 U	0.014 U	0.015 U	0.014 U
Pyridine	NS	NS	NS	3.6 U	3.4 U	3.4 U	3.6 U	3.7 U	3.4 U

**Flushing Commons**  
**Flushing New York**  
**Subsurface Investigation**  
*Semi-Volatile Organic Compounds*

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-10 (0.5-2.5') 4/12/2006 L0605260-22 mg/kg	SS-10 (6-8') 4/12/2006 L0605260-23 mg/kg	SS-11 (0.5-2.5') 4/12/2006 L0605260-24 mg/kg	SS-11 (10-11') 4/12/2006 L0605260-25 mg/kg
1,2,4,5-Tetrachlorobenzene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
1,2,4-Trichlorobenzene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
1,2-Dichlorobenzene	1.1	100	500	0.35 U	0.35 U	0.34 U	0.35 U
1,3-Dichlorobenzene	2.4	49	280	0.35 U	0.35 U	0.34 U	0.35 U
1,4-Dichlorobenzene	1.8	13	130	0.35 U	0.35 U	0.34 U	0.35 U
1-Chloronaphthalene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
1-Methylnaphthalene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
1-Methylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
1-Methylphenanthrene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
2,4,5-Trichlorophenol	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2,4,6-Trichlorophenol	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2,4-Dichlorophenol	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
2,4-Dimethylphenol	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2,4-Dinitrophenol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
2,4-Dinitrotoluene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2,6-Dichlorophenol	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
2,6-Dimethylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
2,6-Dinitrotoluene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2-Chloronaphthalene	NS	NS	NS	0.42 U	0.42 U	0.41 U	0.42 U
2-Chloronaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
2-Chlorophenol	NS	NS	NS	0.42 U	0.42 U	0.41 U	0.42 U
2-Methylnaphthalene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2-Methylnaphthalene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
2-Methylphenol	0.33	100	500	0.42 U	0.42 U	0.41 U	0.42 U
2-Nitroaniline	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
2-Nitrophenol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
2-Picoline	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
3,3'-Dichlorobenzidine	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
3-Methylcholanthrene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
3-Methylphenol/4-Methylphenol	0.33	100	500	0.42 U	0.42 U	0.41 U	0.42 U
3-Nitroaniline	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
4,6-Dinitro-o-cresol	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
4-Aminobiphenyl	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
4-Bromophenyl phenyl ether	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
4-Chloroaniline	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
4-Chlorophenyl phenyl ether	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
4-Nitroaniline	NS	NS	NS	0.49 U	0.49 U	0.48 U	0.5 U
4-Nitrophenol	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
7,12-Dimethylbenz(a)anthracene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
a,a-Dimethylphenethylamine	NS	NS	NS	3.5 U	3.5 U	3.4 U	3.5 U
Acenaphthene	20	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Acenaphthene*	20	100	500	0.014 U	0.014 U	0.014 U	0.014 U
Acenaphthylene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Acenaphthylene*	100	100	500	0.014 U	0.014 U	0.014 U	0.014 U
Acetophenone	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
a-Naphthylamine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Aniline	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Anthracene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Anthracene*	100	100	500	0.014 U	0.014 U	0.014 U	0.014 U
Azobenzene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Benzidine	NS	NS	NS	3.5 U	3.5 U	3.4 U	3.5 U
Benzo(a)anthracene	1	1	5.6	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(a)anthracene*	1	1	5.6	0.018	0.014 U	0.014 U	0.014 U
Benzo(a)pyrene	1	1	1	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(a)pyrene*	1	1	1	0.04	0.014 U	0.014 U	0.014 U
Benzo(b)fluoranthene	1	1	5.6	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(b)fluoranthene*	1	1	5.6	0.029	0.014 U	0.014 U	0.014 U
Benzo(e)pyrene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(e)Pyrene*	NS	NS	NS	0.036	0.014 U	0.014 U	0.014 U
Benzo(ghi)perylene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(ghi)perylene*	100	100	500	0.03	0.014 U	0.014 U	0.014 U
Benzo(k)fluoranthene	0.8	3.9	56	0.35 U	0.35 U	0.34 U	0.35 U
Benzo(k)fluoranthene*	0.8	3.9	56	0.02	0.014 U	0.014 U	0.014 U
Benzoic Acid	NS	NS	NS	3.5 U	3.5 U	3.4 U	3.5 U
Benzyl Alcohol	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Biphenyl	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Biphenyl*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
Bis(2-chloroethoxy)methane	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Bis(2-chloroethyl)ether	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Bis(2-chloroisopropyl)ether	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Bis(2-ethylhexyl)phthalate	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
b-Naphthylamine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Butyl benzyl phthalate	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Carbazole	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Chlorobenzilate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U

**Flushing Commons  
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Semi-Volatile Organic Compounds

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-10 (0.5-2.5') 4/12/2006 L0605260-22 mg/kg	SS-10 (6-8') 4/12/2006 L0605260-23 mg/kg	SS-11 (0.5-2.5') 4/12/2006 L0605260-24 mg/kg	SS-11 (10-11') 4/12/2006 L0605260-25 mg/kg
Chrysene	1	3.9	56	0.35 U	0.35 U	0.34 U	0.35 U
Chrysene*	1	3.9	56	0.019	0.014 U	0.014 U	0.014 U
Dibenzo(a,h)anthracene	0.33	0.33	0.56	0.35 U	0.35 U	0.34 U	0.35 U
Dibenzo(a,h)anthracene*	0.33	0.33	0.56	0.014 U	0.014 U	0.014 U	0.014 U
Dibenzofuran	7	59	350	0.35 U	0.35 U	0.34 U	0.35 U
Diethyl phthalate	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Dimethoate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Dimethyl phthalate	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Di-n-butylphthalate	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Di-n-octylphthalate	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Ethyl Methanesulfonate	NS	NS	NS	1 U	1 U	1 U	1.1 U
Fluoranthene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Fluoranthene*	100	100	500	0.014	0.014 U	0.014 U	0.014 U
Fluorene	30	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Fluorene*	30	100	500	0.014 U	0.014 U	0.014 U	0.014 U
Hexachlorobenzene	0.33	1.2	6	0.35 U	0.35 U	0.34 U	0.35 U
Hexachlorobenzene*	0.33	1.2	6	0.056 U	0.056 U	0.055 U	0.057 U
Hexachlorobutadiene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Hexachlorobutadiene*	NS	NS	NS	0.035 U	0.035 U	0.034 U	0.035 U
Hexachlorocyclopentadiene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Hexachloroethane	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Hexachloroethane*	NS	NS	NS	0.056 U	0.056 U	0.055 U	0.057 U
Hexachloropropene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Indeno(1,2,3-cd)pyrene	0.5	0.5	5.6	0.35 U	0.35 U	0.34 U	0.35 U
Indeno(1,2,3-cd)Pyrene*	0.5	0.5	5.6	0.024	0.014 U	0.014 U	0.014 U
Isodrin	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Isophorone	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Methyl methanesulfonate	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Naphthalene	12	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Naphthalene*	12	100	500	0.014 U	0.014 U	0.014 U	0.014 U
NDPA/DPA	NS	NS	NS	1 U	1 U	1 U	1.1 U
Nitrobenzene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Nitrosodi-n-butylamine	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Nitrosodipiperidine	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
n-Nitrosodimethylamine	NS	NS	NS	3.5 U	3.5 U	3.4 U	3.5 U
n-Nitrosodi-n-propylamine	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
p-Chloro-m-cresol	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
p-Dimethylaminoazobenzene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Pentachlorobenzene	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Pentachloronitrobenzene	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Pentachlorophenol	0.8	6.7	6.7	1.4 U	1.4 U	1.4 U	1.4 U
Pentachlorophenol*	0.8	6.7	6.7	0.056 U	0.056 U	0.055 U	0.057 U
Perylene	NS	NS	NS	0.35 U	0.35 U	0.34 U	0.35 U
Perylene*	NS	NS	NS	0.014 U	0.014 U	0.014 U	0.014 U
Phenacetin	NS	NS	NS	0.7 U	0.7 U	0.69 U	0.71 U
Phenanthrene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Phenanthrene*	100	100	500	0.014 U	0.014 U	0.014 U	0.014 U
Phenol	0.33	100	500	0.49 U	0.49 U	0.48 U	0.5 U
Pronamide	NS	NS	NS	1.4 U	1.4 U	1.4 U	1.4 U
Pyrene	100	100	500	0.35 U	0.35 U	0.34 U	0.35 U
Pyrene*	100	100	500	0.015	0.014 U	0.014 U	0.014 U
Pyridine	NS	NS	NS	3.5 U	3.5 U	3.4 U	3.5 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
Metals**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-1 (0.5-2.5') 4/11/2006 L0605260-01 mg/kg	SS-1 (24-26') 4/11/2006 L0605260-02 mg/kg	SS-2 (0.5-2.5') 4/12/2006 L0605260-04 mg/kg	SS-2 (6-8') 4/12/2006 L0605260-05 mg/kg	SS-3 (0.5-2.5') 4/12/2006 L0605260-06 mg/kg	SS-3 (9-11') 4/12/2006 L0605260-07 mg/kg	SS-4 (0.5-2.5') 4/11/2006 L0605260-08 mg/kg	SS-4 (42-44') 4/11/2006 L0605260-09 mg/kg
Aluminum, Total	NS	NS	NS	7000	2100	4000	2900	3600	3600	5600	1900
Antimony, Total	NS	NS	NS	2.2 U	2.2 U	2.2 U	2.1 U	2.2 U	2.2 U	2.2 U	2.3 U
Arsenic, Total	13	16	16	1.7	0.48	2.3	0.63	0.76	0.64	1.4	0.73
Barium, Total	350	400	400	36	15	37	22	28	30	36	22
Beryllium, Total	7.2	72	590	0.22 U	0.22 U	0.22 U	0.21 U	0.22 U	0.22 U	0.22 U	0.23 U
Cadmium, Total	2.5	4.3	9.3	0.44 U	0.44 U	0.43 U	0.42 U	0.43 U	0.44 U	0.44 U	0.45 U
Calcium, Total	NS	NS	NS	720	510	1800	450	1100	720	670	320
Chromium, Total	30	180	1500	14	16	14	7.1	9.2	13	18	10
Cobalt, Total	NS	NS	NS	6.9	3.6	6	3	4.8	6.9	9.1	2.6
Copper, Total	50	270	270	13	17	22	8.3	15	13	13	5.3
Iron, Total	NS	NS	NS	14000	7400	13000	6500	9700	9100	13000	7200
Lead, Total	63	400	1000	2.8	2.2 U	95	2.1 U	2.4	2.4	4.8	2.3 U
Magnesium, Total	NS	NS	NS	2000	840	1400	700	1200	1300	1600	890
Manganese, Total	1600	2000	10000	160	150	300	270	220	330	410	200
Mercury, Total	0.18	0.81	2.8	0.091 U	0.087 U	0.16	0.087 U	0.082 U	0.087 U	0.091 U	0.089 U
Nickel, Total	30	310	310	12	7	13	8.8	7.5	31	16	6.3
Potassium, Total	NS	NS	NS	1500	480	760	320	820	1000	1000	480
Selenium, Total	3.9	180	1500	0.88 U	0.88 U	0.86 U	0.84 U	0.86 U	0.88 U	0.88 U	0.9 U
Silver, Total	2	180	1500	0.44 U	0.44 U	0.43 U	0.42 U	0.43 U	0.44 U	0.44 U	0.45 U
Sodium, Total	NS	NS	NS	160	88 U	190	110	94	240	210	90 U
Thallium, Total	NS	NS	NS	0.44 U	0.44 U	0.43 U	0.42 U	0.43 U	0.44 U	0.44 U	0.45 U
Vanadium, Total	NS	NS	NS	20	9.2	19	8.4	13	14	20	9.2
Zinc, Total	109	10000	10000	18	9.4	54	9.8	16	14	24	9.9

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LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-5 (0.5-2.5') 4/12/2006 L0605260-11 mg/kg	SS-5 (5-7') 4/12/2006 L0605260-12 mg/kg	SS-6 (0.5-2.5') 4/12/2006 L0605260-13 mg/kg	SS-6 (18-20') 4/12/2006 L0605260-14 mg/kg	SS-7 (0.5-2.0') 4/12/2006 L0605260-15 mg/kg	SS-7 (23-24') 4/12/2006 L0605260-16 mg/kg	SS-8 (0.5-2.5') 4/12/2006 L0605260-17 mg/kg	SS-8 (6-8') 4/12/2006 L0605260-18 mg/kg
Aluminum, Total	NS	NS	NS	6000	5500	4800	1800	5400	3000	2700	6400
Antimony, Total	NS	NS	NS	2.2 U	2.2 U	2.1 U	2 U	2.1 U	2 U	2 U	2.2 U
Arsenic, Total	13	16	16	1.1	1.3	1.1	0.51	2	0.69	0.96	0.79
Barium, Total	350	400	400	46	41	40	19	65	28	33	53
Beryllium, Total	7.2	72	590	0.22 U	0.22 U	0.21 U	0.2 U	0.21 U	0.2 U	0.2 U	0.22 U
Cadmium, Total	2.5	4.3	9.3	0.44 U	0.44 U	0.43 U	0.41 U	0.43 U	0.41 U	0.4 U	0.43 U
Calcium, Total	NS	NS	NS	2400	950	1400	290	2800	910	3500	1000
Chromium, Total	30	180	1500	20	23	14	8	17	13	8.7	21
Cobalt, Total	NS	NS	NS	7.5	8.4	6.3	3.1	7	4.6	3.8	8.4
Copper, Total	50	270	270	14	18	15	5	23	8.2	11	16
Iron, Total	NS	NS	NS	14000	16000	12000	6300	15000	7500	6900	14000
Lead, Total	63	400	1000	3.8	4	20	2 U	300	3.4	59	3.1
Magnesium, Total	NS	NS	NS	2800	1800	1800	780	1700	1600	2700	2700
Manganese, Total	1600	2000	10000	370	420	330	190	360	260	170	360
Mercury, Total	0.18	0.81	2.8	0.09 U	0.092 U	0.084 U	0.081 U	0.15	0.085 U	0.08 U	0.088 U
Nickel, Total	30	310	310	32	25	16	7.1	14	8.2	11	36
Potassium, Total	NS	NS	NS	1500	1400	1100	680	1200	920	680	2000
Selenium, Total	3.9	180	1500	0.88 U	0.88 U	0.86 U	0.82 U	0.86 U	0.82 U	0.81 U	0.86 U
Silver, Total	2	180	1500	0.44 U	0.44 U	0.43 U	0.41 U	0.43 U	0.41 U	0.4 U	0.43 U
Sodium, Total	NS	NS	NS	320	270	220	120	290	170	83	300
Thallium, Total	NS	NS	NS	0.44 U	0.44 U	0.43 U	0.41 U	0.43 U	0.41 U	0.4 U	0.43 U
Vanadium, Total	NS	NS	NS	23	24	17	9	20	12	9.9	24
Zinc, Total	109	10000	10000	24	26	24	10	72	16	34	28

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LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO mg/kg	NYSDEC Part 375 Restricted Residential SCO mg/kg	NYSDEC Part 375 Commercial SCO mg/kg	SS-9 (0.5-3') 4/11/2006 L0605260-19 mg/kg	SS-9 (22-24') 4/11/2006 L0605260-20 mg/kg	SS-10 (0.5-2.5') 4/12/2006 L0605260-22 mg/kg	SS-10 (6-8') 4/12/2006 L0605260-23 mg/kg	SS-11 (0.5-2.5') 4/12/2006 L0605260-24 mg/kg	SS-11 (10-11') 4/12/2006 L0605260-25 mg/kg
Aluminum, Total	NS	NS	NS	6700	1800	5500	5000	4700	4400
Antimony, Total	NS	NS	NS	2.2 U	2 U	2.1 U	2.1 U	2 U	2.1 U
Arsenic, Total	13	16	16	1.4	0.63	1.3	1	1.8	1.3
Barium, Total	350	400	400	41	18	38	22	39	28
Beryllium, Total	7.2	72	590	0.22 U	0.2 U	0.21 U	0.21 U	0.2 U	0.21 U
Cadmium, Total	2.5	4.3	9.3	0.44 U	0.41 U	0.42 U	0.42 U	0.41 U	0.42 U
Calcium, Total	NS	NS	NS	670	610	3900	730	8400	1300
Chromium, Total	30	180	1500	19	6.8	14	14	11	24
Cobalt, Total	NS	NS	NS	6.9	3.3	6.6	7.6	4.9	5.8
Copper, Total	50	270	270	16	6.1	16	21	17	15
Iron, Total	NS	NS	NS	14000	5500	13000	13000	10000	11000
Lead, Total	63	400	1000	6.3	2 U	16	2.5	86	3.1
Magnesium, Total	NS	NS	NS	1800	870	3600	2000	6300	1900
Manganese, Total	1600	2000	10000	300	200	350	260	190	290
Mercury, Total	0.18	0.81	2.8	0.086 U	0.08 U	0.086 U	0.085 U	0.13	0.085 U
Nickel, Total	30	310	310	14	8.2	13	18	11	17
Potassium, Total	NS	NS	NS	1400	490	1400	1400	1000	1200
Selenium, Total	3.9	180	1500	0.89 U	0.82 U	0.84 U	0.83 U	0.82 U	0.84 U
Silver, Total	2	180	1500	0.44 U	0.41 U	0.42 U	0.42 U	0.41 U	0.42 U
Sodium, Total	NS	NS	NS	340	82	520	240	620	270
Thallium, Total	NS	NS	NS	0.44 U	0.41 U	0.42 U	0.42 U	0.41 U	0.42 U
Vanadium, Total	NS	NS	NS	23	8.6	19	20	15	16
Zinc, Total	109	10000	10000	34	10	25	21	45	20

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
PCBs and Pesticides**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-1 (0.5-2.5') 4/11/2006 L0605260-01 mg/kg	SS-1 (24-26') 4/11/2006 L0605260-02 mg/kg	SS-2 (0.5-2.5') 4/12/2006 L0605260-04 mg/kg	SS-2 (6-8') 4/12/2006 L0605260-05 mg/kg	SS-3 (0.5-2.5') 4/12/2006 L0605260-06 mg/kg	SS-3 (9-11') 4/12/2006 L0605260-07 mg/kg	SS-4 (0.5-2.5') 4/11/2006 L0605260-08 mg/kg	SS-4 (42-44') 4/11/2006 L0605260-09 mg/kg
<b>PCBs</b>	mg/kg	mg/kg	mg/kg								
Aroclor 1016	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1221	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1232	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1242	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1248	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1254	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
Aroclor 1260	NS	NS	NS	0.037 U	0.0366 U	0.0366 U	0.0355 U	0.0362 U	0.0366 U	0.037 U	0.0379 U
<b>Total PCBs</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>

**Pesticides**

4,4'-DDD	0.0033	13	92	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
4,4'-DDE	0.0033	8.9	62	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
4,4'-DDT	0.0033	7.9	47	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Aldrin	0.005	0.097	0.68	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Alpha-BHC	0.02	0.48	3.4	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Beta-BHC	0.036	0.36	3	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Chlordane	0.094	4.2	24	0.0148 U	0.0733 U	0.293 U	0.0142 U	0.0725 U	0.0146 U	0.0148 U	0.0152 U
cis-Chlordane	0.094	4.2	24	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Delta-BHC	0.04	100	500	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Dieldrin	0.005	0.2	1.4	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endosulfan I	2.4	24	200	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endosulfan II	2.4	24	200	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endosulfan sulfate	2.4	24	200	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endrin	0.014	11	89	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endrin aldehyde	NS	NS	NS	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Endrin ketone	NS	NS	NS	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Heptachlor	0.042	2.1	15	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Heptachlor epoxide	NS	NS	NS	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Lindane	0.1	1.3	9.2	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U
Methoxychlor	NS	NS	NS	0.0148 U	0.0733 U	0.293 U	0.0142 U	0.0725 U	0.0146 U	0.0148 U	0.0152 U
Toxaphene	NS	NS	NS	0.0148 U	0.0733 U	0.293 U	0.0142 U	0.0725 U	0.0146 U	0.0148 U	0.0152 U
trans-Chlordane	NS	NS	NS	0.0037 U	0.0183 U	0.0733 U	0.00355 U	0.0181 U	0.00366 U	0.0037 U	0.00379 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
PCBs and Pesticides**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-5 (0.5-2.5') 4/12/2006 L0605260-11 mg/kg	SS-5 (5-7') 4/12/2006 L0605260-12 mg/kg	SS-6 (0.5-2.5') 4/12/2006 L0605260-13 mg/kg	SS-6 (18-20') 4/12/2006 L0605260-14 mg/kg	SS-7 (0.5-2.0') 4/12/2006 L0605260-15 mg/kg	SS-7 (23-24') 4/12/2006 L0605260-16 mg/kg	SS-8 (0.5-2.5') 4/12/2006 L0605260-17 mg/kg	SS-8 (6-8') 4/12/2006 L0605260-18 mg/kg
<b>PCBs</b>	mg/kg	mg/kg	mg/kg								
Aroclor 1016	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1221	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1232	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1242	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1248	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1254	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
Aroclor 1260	NS	NS	NS	0.037 U	0.037 U	0.0358 U	0.0347 U	0.0362 U	0.0344 U	0.034 U	0.0362 U
<b>Total PCBs</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>

**Pesticides**

4,4'-DDD	0.0033	13	92	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
4,4'-DDE	0.0033	8.9	62	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
4,4'-DDT	0.0033	7.9	47	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Aldrin	0.005	0.097	0.68	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Alpha-BHC	0.02	0.48	3.4	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Beta-BHC	0.036	0.36	3	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Chlordane	0.094	4.2	24	0.0741 U	0.296 U	0.0717 U	0.0139 U	0.0725 U	0.275 U	0.068 U	0.0145 U
cis-Chlordane	0.094	4.2	24	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Delta-BHC	0.04	100	500	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Dieldrin	0.005	0.2	1.4	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endosulfan I	2.4	24	200	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endosulfan II	2.4	24	200	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endosulfan sulfate	2.4	24	200	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endrin	0.014	11	89	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endrin aldehyde	NS	NS	NS	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Endrin ketone	NS	NS	NS	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Heptachlor	0.042	2.1	15	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Heptachlor epoxide	NS	NS	NS	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Lindane	0.1	1.3	9.2	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U
Methoxychlor	NS	NS	NS	0.0741 U	0.296 U	0.0717 U	0.0139 U	0.0725 U	0.275 U	0.068 U	0.0145 U
Toxaphene	NS	NS	NS	0.0741 U	0.296 U	0.0717 U	0.0139 U	0.0725 U	0.275 U	0.068 U	0.0145 U
trans-Chlordane	NS	NS	NS	0.0185 U	0.0741 U	0.0179 U	0.00347 U	0.0181 U	0.0687 U	0.017 U	0.00362 U

**Flushing Commons  
Flushing New York  
Subsurface Investigation  
PCBs and Pesticides**

LOCATION SAMPLING DATE LAB SAMPLE ID UNIT	NYSDEC Part 375 Unrestricted SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Commercial SCO	SS-9 (0.5-3') 4/11/2006 L0605260-19 mg/kg	SS-9 (22-24') 4/11/2006 L0605260-20 mg/kg	SS-10 (0.5-2.5') 4/12/2006 L0605260-22 mg/kg	SS-10 (6-8') 4/12/2006 L0605260-23 mg/kg	SS-11 (0.5-2.5') 4/12/2006 L0605260-24 mg/kg	SS-11 (10-11') 4/12/2006 L0605260-25 mg/kg
<b>PCBs</b>	mg/kg	mg/kg	mg/kg						
Aroclor 1016	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1221	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1232	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1242	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1248	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1254	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
Aroclor 1260	NS	NS	NS	0.037 U	0.034 U	0.0351 U	0.0351 U	0.0344 U	0.0355 U
<b>Total PCBs</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	ND	ND	ND	ND	ND	ND

**Pesticides**

4,4'-DDD	0.0033	13	92	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
4,4'-DDE	0.0033	8.9	62	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
4,4'-DDT	0.0033	7.9	47	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Aldrin	0.005	0.097	0.68	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Alpha-BHC	0.02	0.48	3.4	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Beta-BHC	0.036	0.36	3	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Chlordane	0.094	4.2	24	0.296 U	0.0136 U	0.281 U	0.014 U	0.275 U	0.0709 U
cis-Chlordane	0.094	4.2	24	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Delta-BHC	0.04	100	500	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Dieldrin	0.005	0.2	1.4	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endosulfan I	2.4	24	200	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endosulfan II	2.4	24	200	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endosulfan sulfate	2.4	24	200	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endrin	0.014	11	89	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endrin aldehyde	NS	NS	NS	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Endrin ketone	NS	NS	NS	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Heptachlor	0.042	2.1	15	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Heptachlor epoxide	NS	NS	NS	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Lindane	0.1	1.3	9.2	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U
Methoxychlor	NS	NS	NS	0.296 U	0.0136 U	0.281 U	0.014 U	0.275 U	0.0709 U
Toxaphene	NS	NS	NS	0.296 U	0.0136 U	0.281 U	0.014 U	0.275 U	0.0709 U
trans-Chlordane	NS	NS	NS	0.0741 U	0.0034 U	0.0702 U	0.00351 U	0.0687 U	0.0177 U

## Flushing Commons

## Flushing New York

### Notes

Exceedences of Part 375 Unrestricted SCOs are highlighted in gray with bold font.

U - The analyte was not detected at the indicated concentration.

B - Method Blank contamination. The associated method blank contains the target analyte at a reportable level.

E - Estimated result. Result concentration exceeds the calibration range.

J - Estimated result. Result is less than RL.

ND - Not Detected.

NS - No soil cleanup objective listed.

\* Polycyclic Aromatic Hydrocarbons (PAHs)

## **APPENDIX 3**

### **CITIZEN PARTICIPATION PLAN**

The NYC Office of Environmental Remediation and Flushing Commons, LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, Flushing Commons, LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Shana Holberton, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-3220.

**Project Contact List.** OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the

Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at [brownfields@cityhall.nyc.gov](mailto:brownfields@cityhall.nyc.gov).

**Repositories.** A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. AKRF will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Queens Library at Flushing  
41-17 Main Street, Flushing, NY 11355  
(718) 661-1200

Repository Hours of Operation

Monday	9:00 AM - 9:00 PM
Tuesday	<b>1:00 PM - 9:00 PM</b>
Wednesday	9:00 AM - 9:00 PM
Thursday	9:00 AM - 9:00 PM
Friday	9:00 AM - 7:00 PM
Saturday	9:00 AM - 7:00 PM
Sunday	<b>Closed</b>

**Digital Documentation.** NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

**Public Notice and Public Comment.** Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by AKRF, reviewed and approved by OER prior to distribution and mailed by AKRF. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

**Citizen Participation Milestones.** Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- Public Notice announcing the approval of the RAWP and the start of remediation

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

# **APPENDIX 4**

## **SUSTAINABILITY STATEMENT**

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

**Reuse of Clean, Recyclable Materials.** Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

**Reduce Consumption of Virgin and Non-Renewable Resources.** Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

**Reduced Energy Consumption and Promotion of Greater Energy Efficiency.** Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

**Conversion to Clean Fuels.** Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

**Recontamination Control.** Recontamination after cleanup and redevelopment is

completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

Measures to limit the potential for recontamination include complete removal of fill materials and the use of a waterproofing system. In the event that a Track 1 cleanup cannot be achieved, the waterproofing system would be an engineering control and serve as a vapor barrier to prevent potential vapor intrusion.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

**Storm-water Retention.** Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

**Linkage with Green Building.** Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

**Paperless Voluntary Cleanup Program.** Flushing Commons, LLC is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

**Low-Energy Project Management Program.** Flushing Commons, LCC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and

teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

**Trees and Plantings.** Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

## **APPENDIX 5**

### **SOIL/MATERIALS MANAGEMENT PLAN**

#### **1.1 Soil Screening Methods**

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

#### **1.2 Stockpile Methods**

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

#### **1.3 Characterization of Excavated Materials**

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

#### **1.4 Materials Excavation, Load-Out and Departure**

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site; and
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

#### **1.5 Off-Site Materials Transport**

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are described in Section 5.8 of the RAWP. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

#### **1.6 Materials Disposal Off-Site**

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Queens, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization

sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

Disposal of soil/fill from this Site may include materials for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility. A formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

#### **1.7 Materials Reuse On-Site**

On-site soil/fill is not expected to be reused or relocated on Site. If required, soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

#### **1.8 Demarcation**

Demarcation will not be required, as all contaminants exceeding Track 1 SCOs will be removed from the Site.

## **1.9 Import of Backfill Soil from Off-Site Sources**

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The current redevelopment plan does not include the importation of soil to be used as a cap. The landscaped area on the grade level will be placed above the concrete parking garage.

If these plans change and a soil cover becomes necessary, a process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

### **1.9.1 Source Screening and Testing**

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material. Virgin quarried stone would also not be tested prior to import.

#### **1.10 Fluids Management**

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

### **1.11 Storm-water Pollution Prevention**

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

### **1.12 Contingency Plan**

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

### **1.13 Odor, Dust and Nuisance Control**

#### **1.13.1 Odor Control**

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a

minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

### **1.13.2 Dust Control**

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

### **1.13.3 Other Nuisances**

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

**APPENDIX 6**

**EXAMPLES OF HAZARDOUS AND**

**NON-HAZARDOUS WASTE MANIFESTS**



Manifest # \_\_\_\_\_

GLOBAL JOB NUMBER: \_\_\_\_\_ FACILITY APPROVAL NUMBER: \_\_\_\_\_

**Please Check One:**

- |   |   |  |   |
|---|---|--|---|
| <input type="checkbox"/> Clean Earth of Carteret<br>24 Middlesex Avenue<br>Carteret, NJ 07008<br>Ph: 732-541-8909         | <input type="checkbox"/> Clean Earth of Maryland<br>1469 Oak Ridge Place<br>Hagerstown, MD 21740<br>Ph: 301-791-6220        | <input type="checkbox"/> Clean Earth of New Castle<br>94 Pyles Lane<br>New Castle, DE 19720<br>Ph: 302-427-6633                  | <input type="checkbox"/> Other<br>_____ |
| <input type="checkbox"/> Clean Earth of Philadelphia<br>3201 S. 61st Street<br>Philadelphia, PA 19153<br>Ph: 215-724-5520 | <input type="checkbox"/> Clean Earth of West Virginia<br>3815 South State Route 2<br>Friendly, WV 26146<br>Ph: 304-652-8580 | <input type="checkbox"/> Clean Earth of Southeast Pennsylvania<br>7 Steel Road East<br>Morrisville, PA 19067<br>Ph: 215-428-1700 | _____                                   |

**Non-Hazardous Material Manifest**

(Type or Print Clearly)

GENERATOR'S NAME & SITE ADDRESS:	GROSS WEIGHT: <input checked="" type="checkbox"/> Tons <input type="checkbox"/> Yards
	TARE WEIGHT: <input checked="" type="checkbox"/> Tons <input type="checkbox"/> Yards
GENERATOR'S PHONE: _____	NET WEIGHT: <input checked="" type="checkbox"/> Tons <input type="checkbox"/> Yards

**DESCRIPTION OF MATERIAL/SAMPLE ID AND LOCATION**

**GENERATOR'S CERTIFICATION** – Incomplete and/or unsigned manifests will cause the load to be delayed and/or rejected.

I hereby certify that the above named material does not contain free liquid as defined by 40 CFR Part 260.10 or any applicable state law, is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, is not a DOT hazardous substance as defined by 49 CFR Part 172 or any applicable state law, has been fully and accurately described above, classified, packaged and is in proper condition for transportation according to all applicable state and federal regulations.

Name: \_\_\_\_\_ Title: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date and Time: \_\_\_\_\_

**TRANSPORTER**

Company: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Address: \_\_\_\_\_ Truck # and License Plate: \_\_\_\_\_  
Driver: \_\_\_\_\_ SW Haulers Permit #: \_\_\_\_\_  
(Type or Print Clearly) (applicable state permit #)

I hereby certify that the above named material was picked up at the site listed above.

Driver Signature: \_\_\_\_\_ Date and Time: \_\_\_\_\_

**DESTINATION**

I hereby certify that the above named material was delivered without incident to the facility noted above.

Driver Signature: \_\_\_\_\_ Date and Time: \_\_\_\_\_

I hereby certify that the above named material has been accepted at the above referenced facility.

Authorized Signature: \_\_\_\_\_ Date and Time: \_\_\_\_\_

**NON-HAZARDOUS  
WASTE MANIFEST**

1. Generator ID Number

2. Page 1 of

3. Emergency Response Phone

4. Waste Tracking Number

5. Generator's Name and Mailing Address

Generator's Site Address (if different than mailing address)

Generator's Phone:

6. Transporter 1 Company Name

U.S. EPA ID Number

7. Transporter 2 Company Name

U.S. EPA ID Number

8. Designated Facility Name and Site Address

U.S. EPA ID Number

Facility's Phone:

9. Waste Shipping Name and Description

10. Containers

11. Total Quantity

12. Unit Wt./Vol.

No.

Type

1.

2.

3.

4.

13. Special Handling Instructions and Additional Information

**14. GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name

Signature

Month Day Year

15. International Shipments  Import to U.S.

Export from U.S.

Port of entry/exit:

Transporter Signature (for exports only):

Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name

Signature

Month Day Year

Transporter 2 Printed/Typed Name

Signature

Month Day Year

17. Discrepancy

17a. Discrepancy Indication Space

Quantity

Type

Residue

Partial Rejection

Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)

U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator)

Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name

Signature

Month Day Year

GENERATOR

TRANSPORTER INT'L

DESIGNATED FACILITY

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		1. Generator ID Number		2. Page 1 of	3. Emergency Response Phone		4. Manifest Tracking Number <b>010916876 JJK</b>			
		5. Generator's Name and Mailing Address					Generator's Site Address (if different than mailing address)			
Generator's Phone:							U.S. EPA ID Number			
6. Transporter 1 Company Name							U.S. EPA ID Number			
7. Transporter 2 Company Name							U.S. EPA ID Number			
8. Designated Facility Name and Site Address							U.S. EPA ID Number			
Facility's Phone:										
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes				
		No.	Type							
1.										
2.										
3.										
4.										
14. Special Handling Instructions and Additional Information										
<p><b>15. GENERATOR'S/OFFEROR'S CERTIFICATION:</b> I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.</p> <p>I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.</p>										
Generator's/Offeror's Printed/Typed Name					Signature			Month	Day	Year
<p>16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____</p> <p>Transporter signature (for exports only): _____ Date leaving U.S.: _____</p>										
17. Transporter Acknowledgment of Receipt of Materials										
Transporter 1 Printed/Typed Name					Signature			Month	Day	Year
Transporter 2 Printed/Typed Name					Signature			Month	Day	Year
18. Discrepancy										
<p>18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection</p> <p style="text-align: right;">Manifest Reference Number: _____</p>										
18b. Alternate Facility (or Generator)					U.S. EPA ID Number					
Facility's Phone: _____										
18c. Signature of Alternate Facility (or Generator)							Month	Day	Year	
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)										
1.	2.	3.	4.							
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a										
Printed/Typed Name					Signature			Month	Day	Year

**APPENDIX 7**

**SPECIFICATIONS FOR WATERPROOFING**

**MEMBRANE**

## PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

### Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

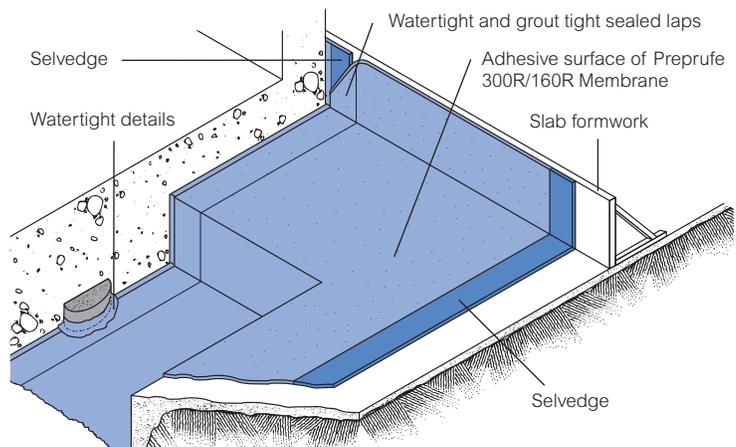
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners**—preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

### Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered watertight laps** and detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **BBA Certified** for basement Grades 2, 3, & 4 to BS 8102:1990
- **Zero permeance** to moisture
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement
- **Unaffected by wet conditions**—cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
  - not reliant on confining pressures or hydration
  - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack



Drawings are for illustration purposes only. Please refer to [graceconstruction.com](http://graceconstruction.com) for specific application details.

## Installation

The most current application instructions, detail drawings and technical letters can be viewed at [graceconstruction.com](http://graceconstruction.com). For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

### Substrate Preparation

**All surfaces**—It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

**Horizontal**—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

**Vertical**—Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

### Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe LT data sheet for more information.

**Horizontal substrates**—Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letter 15 for information on suitable rebar chairs for Preprufe.

**Vertical substrates**—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to

overlap. Roll firmly to ensure a watertight seal.

**Roll ends and cut edges**—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

### Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit [graceconstruction.com](http://graceconstruction.com). This manual gives comprehensive guidance and standard details.

### Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

### Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

### Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 1500 psi (10 N/mm<sup>2</sup>) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe.

Figure 1



Figure 2

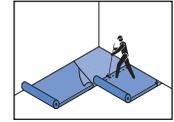
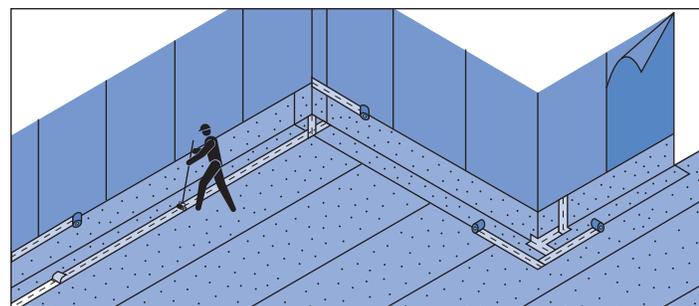
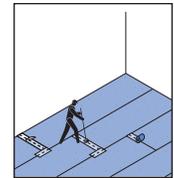


Figure 3

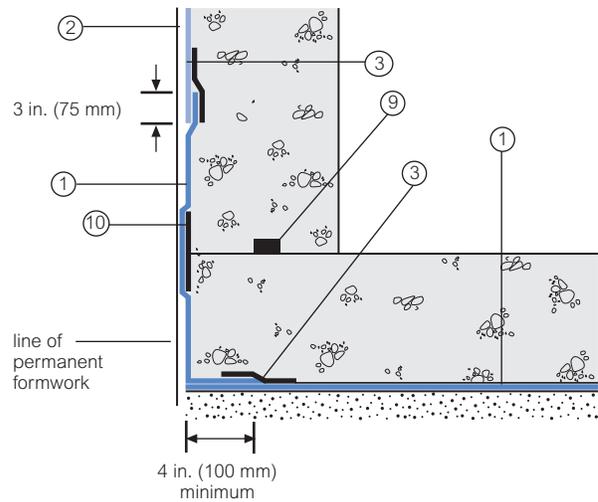


## Detail Drawings

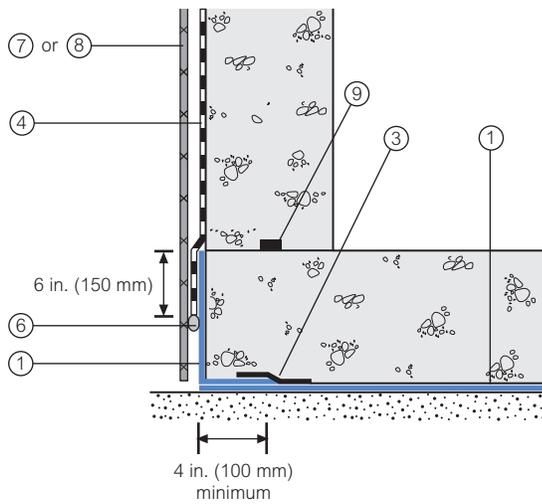
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at [graceconstruction.com](http://graceconstruction.com).

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

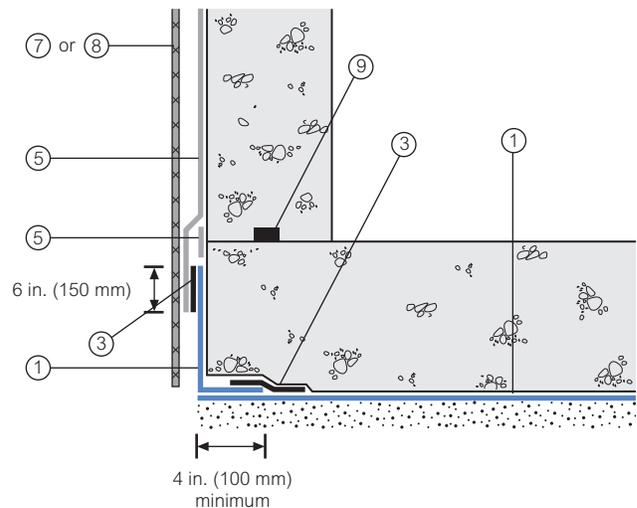
### Wall base detail against permanent shutter



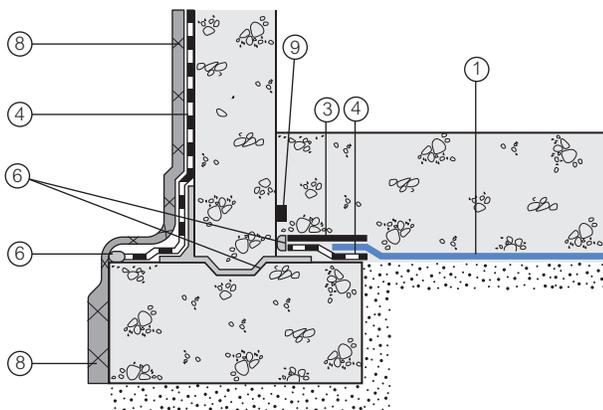
### Bituthene wall base detail (Option 1)



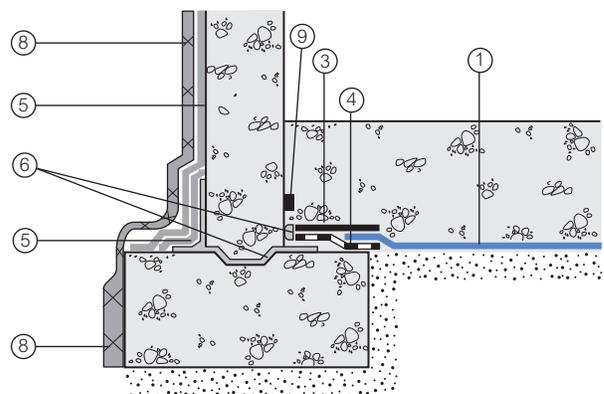
### Procor wall base detail (Option 1)



### Bituthene wall base detail (Option 2)



### Procor wall base detail (Option 2)



- 1 Preprufe 300R
- 2 Preprufe 160R
- 3 Preprufe Tape
- 4 Bituthene

- 5 Procor
- 6 Bituthene Liquid Membrane
- 7 Protection

- 8 Hydroduct®
- 9 Adcor ES
- 10 Preprufe CJ Tape

## Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft <sup>2</sup> (36 m <sup>2</sup> )	460 ft <sup>2</sup> (42 m <sup>2</sup> )	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
<b>Ancillary Products</b>			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

## Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified <sup>1</sup>
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified <sup>2</sup>
Elongation	660%	580%	ASTM D412, modified <sup>3</sup>
Tensile strength	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified <sup>4</sup>
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified <sup>5</sup>
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

### Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute.

### Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

### Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

[www.graceconstruction.com](http://www.graceconstruction.com)

For technical assistance call toll free at 866-333-3SBM (3726)

Adcor is a trademark and Preprufe, Bituthene and Hydroduct are registered trademarks of W. R. Grace & Co.—Conn. Procor is a U.S. registered trademark of W. R. Grace & Co.—Conn., and is used in Canada under license from PROCOR LIMITED.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.—Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

This product may be covered by patents or patents pending.  
PF-111G Printed in U.S.A. 6/11

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FA/PDF

**GRACE**

## Chemical Resistance Technical Letter 4

Several series of tests have been conducted to define the chemical resistance of Preprufe® and Bituthene® waterproofing membranes. Both Preprufe and Bituthene membranes are highly resistant to normal ground water conditions which range from alkaline to acidic. In addition, Preprufe and Bituthene waterproofing membranes are unaffected by exposure to salt water.

Occasionally Preprufe and Bituthene may be used in applications which will be subjected to intermittent or even continuous exposure to chemicals. The following guidelines can be used to evaluate the applicability of the Preprufe and Bituthene membrane system.

**NOTE:** Most solvents and fuels will not significantly affect polyethylene film but may soften or dissolve the adhesive compounds exposed at the edge laps. Detailed information on the type of exposure is necessary to make recommendations.

For below slab and blind side applications, a concrete mud-slab or continuous soil retention system will reduce the exposure of the Preprufe membrane laps. For Bituthene wall applications, the use of Bituthene Edgeguard®, or a solvent resistant tape, should be used over the membrane edges to protect the rubberized asphalt from prolonged exposure.

Exposure Conditions	Preprufe and Bituthene Membrane Resistance Rating
Sea water, de-icing salt	Excellent
Acids in solution e.g. sulfuric, acetic, hydrochloric and nitric acid	Excellent
Alkalis e.g. Sodium hydroxide, ammonium hydroxide	Excellent
Alcohols	Very Good
Organic or fuel oils, solvents	Variable (See note.)

[www.graceconstruction.com](http://www.graceconstruction.com)

**For technical assistance call toll free at 866-333-3SBM (3726)**

Preprufe, Bituthene and Edgeguard are registered trademarks of W. R. Grace & Co.–Conn.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.–Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

# High Density Polyethylene Long-Term Durability

## Technical Letter 29

High Density Polyethylene (HDPE) sheet is a major component of the Bituthene® and Preprufe® membranes. The functions of the HDPE are to 1) provide a portion of the waterproofing protection for the structure and 2) provide increased resistance of the waterproofing adhesive from environmental exposure and backfill.

HDPE was chosen for this purpose because it has excellent mechanical properties required for this application including high puncture, tear, and tensile strengths as well as good elongation for bridging any post-formed cracks in the structure. The other advantage of HDPE is that it is extremely resistant to attack and degradation from most chemicals. Consequently, it is typically a leading candidate for use in geomembranes including landfills containment systems, pond liners, and holding tanks for waste liquids.

Below grade waterproofing membranes, such as Preprufe, are often exposed to a variety of soil contaminants in addition to water. These could include alkaline and acidic environments, petroleum-based hydrocarbons, and chlorinated hydrocarbons. A number of studies have been conducted on various materials on the long-term durability of HDPE

after exposure to contaminants. The general conclusion of various studies is that HDPE is one of the more inert materials used in geomembrane systems. A 1990 publication by the American Society of Testing and Materials [1] based on an extensive survey of case study testing concluded that the service life of base polymers, such as HDPE, in flexible membrane liners (FML) used in geotextiles should last hundreds of years without premature failure. However, the study also stated that inappropriate applications or installations, such as excessive exposure to UV, heat, and ozone, could lead to degradation and shorter life expectancy. In summary, the major component of Preprufe, HDPE, provides the necessary mechanical properties for waterproofing and excellent chemical resistance provided the HDPE is protected from excessive exposure to UV, heat, and ozone.

### Reference:

1. Landreth, R. E., Service Life of Geosynthetics in Hazardous Waste Management Facilities, in Geosynthetics: Microstructure and Performance, ASTM ATP 1076, I. D. Peggs, editor, American Society for Testing and Materials, Philadelphia (1990) p. 26.

[www.graceconstruction.com](http://www.graceconstruction.com)

**For technical assistance call toll free at 866-333-3SBM (3726)**

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FA/pdf

# Preprufe® Tape

## DESCRIPTION

Preprufe® Tape is a specially formulated two sided, reinforced pressure sensitive tape. The bottom side of the tape has a highly aggressive pressure sensitive adhesive which is designed to adhere to penetrations, protrusions and Bituthene® membranes. The top side has another layer of adhesive and a protective coating. The protective coating protects the tape from the weather and UV light for up to 30 days after application. A thin flexible film is sandwiched between the two layers of pressure sensitive adhesive. The tape develops a continuous mechanical bond with the concrete that is cast against it.

Preprufe Tape is supplied in rolls and is interwound with a silicone coated release liner.

## USE

Preprufe Tape is used in detail areas including end laps, penetrations and various tie-ins. It is also used to patch damaged areas in the Preprufe membranes. The tape is a critical component of the Preprufe system since it is designed to develop a continuous mechanical bond to concrete that is cast against it.

## APPLICATION

Apply Preprufe Tape when ambient temperatures are -4°C (25°F) or above.

Wipe Preprufe membranes clean to remove any dirt, dust or moisture. Clean the surface of penetrations or protrusions with a wire brush to remove dirt, dust, rust and loose particles.

Unroll the tape and adhere the exposed pressure sensitive adhesive surface to the membrane or penetration. The protective coating surface of the tape should face toward the concrete to be cast.

Use heavy hand pressure or a hand roller to maximize adhesion. Remove the release liner during application. Cast concrete or apply shotcrete within 30 days of application of the tape.

**For Technical Assistance call us at 800-444-6459 (Option 3).**



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Construction Products

## **APPENDIX 8**

# **CONSTRUCTION HEALTH AND SAFETY PLAN**

# Construction Health and Safety Plan

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## Flushing Commons Phase 1A

38-18 Union Street  
Flushing, NY 11354  
Block 4978, Lot 25

OER Project Number: 14RHAN223Q

AKRF Project Number: 10677

CEQR Number 06DME010Q

NYCDEP File 06DEPTECH098Q

**Prepared for:**

**Flushing Commons, LLC**  
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**NOVEMBER 2013**

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## FIGURES

Figure 1 - Hospital Location Map

## APPENDICES

- Appendix A - Potential Health Effects from On-site Contaminants
- Appendix B - Report Forms
- Appendix C - Emergency Hand Signals

## 1.0 PURPOSE

The purpose of this Construction Phase Environmental Health and Safety Plan (CHASP) is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during construction at the project site. The CHASP is intended to minimize health and safety risks resulting from the known and potential presence of hazardous materials on the Site.

This plan is not designed to address potential geotechnical, mechanical, or structural safety concerns, nor to supersede or replace any OSHA regulation and/or local and state construction codes or regulations.

## 2.0 APPLICABILITY

Work subject to this CHASP includes activities that disturb the existing soil or groundwater on-site. The contractors and their subcontractors involved in the construction project will provide a copy of this CHASP to their employees whose work involves any potential exposure to the on-site chemical hazards, and will complete all work in accordance with this CHASP. All work outlined within the CHASP is subject to the Remedial Action Work Plan (RAWP) developed for the Site.

## 3.0 SITE DESCRIPTION

### 3.1 General Information

The Flushing Commons site is bounded by 37<sup>th</sup> Avenue, Union Street, 39<sup>th</sup> Avenue, and 138<sup>th</sup> Street in the Flushing section of Queens, NY and is identified as Block number 4978, Lot 25. This CHASP has been prepared by AKRF, Inc. (AKRF) on behalf of Flushing Commons LLC for the Flushing Commons Phase 1A site (the "Site"). The Site consists of an approximate 67,600-square foot portion of the Flushing Commons site situated on the corner nearest 39<sup>th</sup> Avenue and Union Street. The Site is currently utilized for automotive parking purposes. The location of the Flushing Commons site is provided as Figure 1.

The proposed project will entail the partial demolition of the existing steel structure garage with parking on roof and an access ramp followed by the construction of two mixed use buildings with four levels of sub-grade parking. The construction will entail soil disturbance to approximately 50 feet below grade. Dewatering is expected to be required to accommodate construction of the building foundation.

### 3.2 Hazard Potential

The hazard potential at the Site was evaluated based on findings of a *Phase I Environmental Site Assessment* (AKRF, October 2005), and a *Subsurface (Phase II) Investigation* (AKRF, May 2006). Historic fill material was present in soil directly beneath the asphalt surface, but generally no more than one foot thick. No indications of contamination [e.g., elevated photoionization detector (PID) readings, staining or odors] were detected in any of the recovered soil. Groundwater was encountered at depths of 45 to 48 feet below grade. No sheen or odors were detected in the sampled groundwater.

Soil analytical results were compared to the New York State Department of Environmental Conservation (NYSDEC) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (USCOs) and

Soil Cleanup Objectives for Restricted Residential Use (RRSCOs). Groundwater sample analytical results were compared to the NYSDEC Class GA Ambient Water Quality Standards, which are intended for current or potential potable water supplies, even though groundwater in Manhattan is not a potable source.

No volatile organic compounds (VOCs), PCBs or pesticides were detected in any of the soil samples. Although semivolatile organic compounds (SVOCs) were detected in seven soil samples across the overall Flushing Commons site (only one location on the Phase 1A Site), all were at concentrations below the New York State Department of Environmental Conservation (NYSDEC) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs). Metals were detected in most of the soil samples from the overall Flushing Commons site, but generally at concentrations either below the Unrestricted Use SCOs or within normal background levels encountered in eastern U.S. and New York State soils. Lead [maximum of 300 milligrams per kilogram (mg/Kg)] and nickel (maximum of 36 mg/Kg) were each found in three of the samples above the Unrestricted Use SCOs but below the Restricted Residential SCOs. The maximum lead concentration of 300 mg/Kg was reported in sample SS-7 (0.5'-2') collected on the Phase 1A Site.

Groundwater was encountered at a depth of approximately 45 to 48 feet below surface grade. Two groundwater samples were collected from temporary wells MW-4 and MW-9 for laboratory analysis. Well MW-4 is located north of the Site and MW-9 is located near the southwest corner of the Site by the corner of 39<sup>th</sup> Street and Union Street. Groundwater sample analytical results were compared to the NYSDEC Class GA Ambient Water Quality Standards provided in the Technical and Operational Guidance Series (TOGS) 1.1.1. (Drinking Water Standards), although groundwater in Flushing is not used as a potable source.

Methyl tert-butyl ether (MTBE), a common additive to gasoline, was detected in MW-4, at a concentration of 15 parts per billion (ppb), exceeding the Class GA guideline value of 10 ppb. Chlorinated solvents were detected in both groundwater samples, but only tetrachloroethene (PCE) in the sample from MW-4, detected at a concentration of 12 ppb, exceeded the 5 ppb Class GA standard.

SVOCs were detected in both groundwater samples, but only exceeded the Class GA criteria in sample MW-4. The Class GA standard for all the three SVOCs detected in MW-4, including benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene, is 0.002 ppb. These compounds were detected in MW-4 at concentrations of 0.24 ppb, 0.23 ppb, and 0.20 ppb respectively. Acenaphthene was detected in the sample from MW-9 at a concentration of 0.23 ppb, well below the Class GA standard of 20 ppb. PCBs and pesticides were not detected above method detection limits in either sample. Total and dissolved metals were detected in both samples, in some cases above Class GA groundwater standards. Dissolved metals exceeding the Class GA groundwater standards included barium, chromium, copper, iron, lead, magnesium, nickel, and sodium. The detected compounds and metals were attributable to entrained sediment and/or regional groundwater quality and not to an on-site release.

### 3.3 Hazard Evaluation

The most likely routes of exposure are breathing of volatile and semi-volatile compounds or particulate-laden air released during soil disturbing activities, dermal contact, and accidental ingestion. Appendix A includes specific health effects from chemicals present or potentially

present on-site. Although some of the chemicals of concern listed in the sections below were not detected during the subsurface investigations, they are included here as a precaution. The remaining sections of this CHASP address procedures (including training, air monitoring, work practices and emergency response) to reduce the potential for unnecessary and unacceptable exposure to these contaminants.

The potential adverse health effects from these contaminants are diverse. Many of these compounds are known or suspected to result in chronic illness from long-term exposures. However, due to the limited nature of the proposed construction, only acute effects are a potential concern.

This CHASP addresses potential environmental hazards from the presence of hazardous materials. It is not intended to address the normal hazards of construction work, which are separately covered by OSHA regulations and/or local and state construction codes and regulations.

**3.3.1 Hazards of Concern**

<b>Check all that apply</b>		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm.
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Other
<b>Comments:</b> No personnel are permitted to enter permit confined spaces		

**3.3.2 Physical Characteristics**

<b>Check all that apply</b>		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge
<input checked="" type="checkbox"/> Vapors	<input type="checkbox"/> Unknown	<input type="checkbox"/> Other

**3.3.3 Hazardous Materials**

<b>Check all that apply</b>					
<b>Chemicals</b>	<b>Solids</b>	<b>Sludges</b>	<b>Solvents</b>	<b>Oils</b>	<b>Other</b>
<input type="checkbox"/> Acids	<input checked="" type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input checked="" type="checkbox"/> Halogens	<input type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm.
<input type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input type="checkbox"/> Other	<input type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other: Fill Material	<input checked="" type="checkbox"/> Other – Tars & Other NAPL		<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad.
<input type="checkbox"/> Inks				<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input type="checkbox"/> PCBs					<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input checked="" type="checkbox"/> Other: VOCs & SVOCs					

### 3.3.4 Known and Suspect Chemicals of Concern

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma
Fuel Oil	REL = 350 mg/m <sup>3</sup> PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Lead	REL = 0.05 mg/m <sup>3</sup> PEL = 0.05 mg/m <sup>3</sup>	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Mercury	REL = 0.1 mg/m <sup>3</sup> PEL = 0.05 mg/m <sup>3</sup>	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Naphthalene	REL = 10 ppm PEL = 10 ppm	Irritation eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage
MTBE	REL = NA PEL = NA	Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation.
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m <sup>3</sup>	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; potential carcinogen.
Nickel	REL = 0.015 mg/m <sup>3</sup> PEL = 1 mg/m <sup>3</sup>	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].
Tetrachloroethene (PCE)	PEL = 100 ppm STEL = 200 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, poor coordination; headache, drowsiness; skin erythema (skin redness); liver damage; potential occupational carcinogen
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethene (TCE)	REL = 25 ppm PEL = 100 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen].
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
Particulate	PEL = 15 mg/m <sup>3</sup> (total) PEL = 5 mg/m <sup>3</sup> (respirable)	Irritation eyes, skin, throat, upper respiratory system
Comments: REL = National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit ppm = parts per million mg/m <sup>3</sup> = milligrams per cubic meter		

#### **4.0 HEALTH AND SAFETY OFFICER**

The contractor or engineer will designate one of its personnel as the Site Safety Officer (SSO). The SSO will be a competent person responsible for the implementation of this plan. The SSO will have completed a 40-hour training course (up-dated by an annual refresher) that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. The SSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the SSO must be absent from the site, he/she will designate a suitably qualified replacement that is familiar with the CHASP. If work is stopped for any reason, the OER would be notified immediately.

#### **5.0 TRAINING**

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All construction personnel upon entering the site must attend a brief training meeting, its purpose being to:

- Make workers aware of the potential hazards they may encounter;
- Instruct workers on how to identify potential hazards,
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- Make workers aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the construction crew will be instructed in these objectives before he/she goes onto the site. Construction personnel will be responsible for identifying potential hazards in the work zone. The SSO or other suitably trained individual will be responsible for conducting the training program. Others who enter the site must be accompanied by a suitably-trained construction worker.

#### **6.0 GENERAL WORK PRACTICES**

To protect the health and safety of the field personnel, all field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance in contaminated areas.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands and face thoroughly on leaving the work area and before eating, drinking, or any other such activity. The workers should shower as soon as possible after leaving the site.
- Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat stress.

## 7.0 PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING

### 7.1 Personal Protective Equipment

The personal protection equipment required for various kinds of site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear."

AKRF field personnel and other site personnel will wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 7.2.

#### Level of Protection Summary

LEVEL OF PROTECTION & PPE	Excavation	Other Earth Moving Activities
<b>Level D</b> (x) Steel Toe Shoes (x) Hard Hat <b>(within 25 ft of excavator)</b> (x) Work Gloves	Yes	Yes
(x) Safety Glasses ( ) Face Shield (x) Ear Plugs (within 25 ft of drill rig/excavator) (x) Latex Gloves		
<b>Level D – Modified (in addition to Level D)</b> (x) Tyvek Coveralls	As necessary	As Necessary
(x) Nitrile Gloves ( ) Overboots ( ) Saranex Coveralls		
<b>Level C (in addition to Level D – Modified)</b> ( ) Half-Face Respirator (x) Full Face Respirator ( ) Full-Face PAPR	If PID > 10 ppm (breathing zone)	If PID > 10 ppm (breathing zone)
( ) Particulate Cartridge ( ) Organic Cartridge (x) Dual Organic/Particulate Cartridge		
<b>Comments:</b> Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected).		

### 7.2 Work Zone Air Monitoring and Community Air Monitoring

As outlined in the RAWP, real time air monitoring will be performed with a photoionization detector (PID) and with a particulate air monitor during sampling and excavation work in areas where petroleum or other contamination is encountered. Community air monitoring will be conducted during all intrusive site activities. The air monitoring protocols, action levels and required responses are provided in the October 2013 RAWP prepared for the Site.

Real time air monitoring will be performed with a photoionization detector (PID) and with a particulate air monitor during sampling and excavation work required for Site development. Measurements would be taken prior to commencement of work and continuously during the work as outlined in the following table. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO will set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table.

#### **Action Levels and Required Safety Response Actions**

<b>Instrument</b>	<b>Task to be Monitored</b>	<b>Action Level</b>	<b>Response Action</b>
PID (OVM 580B or equivalent)	All Soil Movement Activities	Less than 10 ppm in breathing zone.	Level D or D-Modified
		Between 10 and 50 ppm	Level C
		More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm.
Particulate monitor (Dustrak, MIE 1000 Personal DataRam or equivalent)	All Soil Movement Activities	Less than 5 mg/m <sup>3</sup>	Level D
		Between 5 mg/m <sup>3</sup> and 125 mg/m <sup>3</sup>	Level C. Apply dust suppression measures. If < 2.5 mg/m <sup>3</sup> , resume work using Level D. Otherwise, use Level C.
		Above 125 mg/m <sup>3</sup>	Stop work. Apply additional dust suppression measures. Resume work when less than 125 mg/m <sup>3</sup> .

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the site for referencing proper operation, maintenance and calibration procedures.

The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

## 8.0 DECONTAMINATION PROCEDURES

### 8.1 Personnel Decontamination

Personnel decontamination (decon), if deemed necessary by the SSO, will take place in a designated decontamination area. This area will be delineated during each stage of work. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Coverall removal (if applicable);
- Glove removal;
- Disposable clothing removal; and
- Field wash of hands and face.

### 8.2 Sampling Equipment Decontamination

Any non-disposable sampling equipment for confirmatory sampling or other equipment that is in contact with contaminated materials will be decontaminated in accordance with the following procedure:

- Double wash with solution of Simple Green<sup>®</sup> and clean tap water;
- Double rinse with clean tap water;
- Rinse with clean distilled water; and
- Allow equipment to air dry.

### 8.3 Heavy Equipment Decontamination

If heavy equipment comes in contact with contaminated materials, it will be decontaminated prior to being relocated to a clean area or leaving the Site. A designated decontamination pad will be constructed, where soil, dust, or oil will be washed off the exterior, undercarriage, and wheels or tracks of the equipment.

## 9.0 EMERGENCY RESPONSE

### 9.1 Emergency Procedures

In the event that an emergency develops on-site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-site; and
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- A spill of oil or other hazardous materials.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below. In the event of an accident or emergency, an Incident Report form should be filled out and placed in the project file. An example Weekly

Safety Report Form and Incident Report Form are provided in Appendix B. Information on emergency hand signals are provided in Appendix C.

### **9.1.1 Chemical Exposure**

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the SSO (via voice and hand signals) of the chemical exposure. The SSO should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- All chemical exposure incidents must be reported in writing to the SSO. The SSO is responsible for completing the Incident Report Form.

### **9.1.2 Personal Injury**

In case of personal injury at the site, the following procedures should be followed:

- Another team member (buddy) should signal the SSO that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The SSO is responsible for making certain that an Incident Report Form is completed. This form is to be submitted to the SSO. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit and eye-wash kit will be kept on-site during the field activities.

### **9.1.3 Evacuation Procedures**

- The SSO will initiate evacuation procedures by signaling to leave the site or containment structure.
- All personnel in the work area should evacuate the area and meet in the common designated area.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.

- The SSO will then give further instruction.

#### 9.1.4 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;
- Keep the area surrounding the problem source clear after the incident occurs; and
- Complete accident report for and distribute to appropriate personnel.

#### 9.1.5 Spill Response

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill will be reported immediately to the SSO. The SSO will then determine and report any required spills to the NYCDEP and/or NYSDEC Hotlines.

Spill control apparatus (sorberent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes. The SSO, in consultation with AKRF's Project Manager, will determine if additional spill response measures are required.

## 9.2 Hospital Directions

The location of the nearest hospital, as shown on Figure 1, is **Flushing Hospital Medical Center**. The address of the hospital is 4500 Parsons Boulevard. The emergency room is on Delaware Avenue, between Burling Street and Parsons Avenue.

<b>Hospital Name:</b>	Flushing Hospital Medical Center
<b>Phone Number:</b>	(718) 670-1191
<b>Address/Location:</b>	4500 Parsons Blvd, Flushing, NY 11355 Intersection of Parsons Blvd and 45 <sup>th</sup> Avenue
<b>Directions:</b>	LEFT on 39 <sup>th</sup> Avenue (one way) RIGHT onto Union Street LEFT onto Roosevelt Avenue RIGHT onto Parsons Blvd RIGHT onto Delaware Avenue  <b>The emergency room entrance to Flushing Hospital Medical Center emergency room is on Delaware Avenue, between Burling Street and Parsons Avenue.</b>

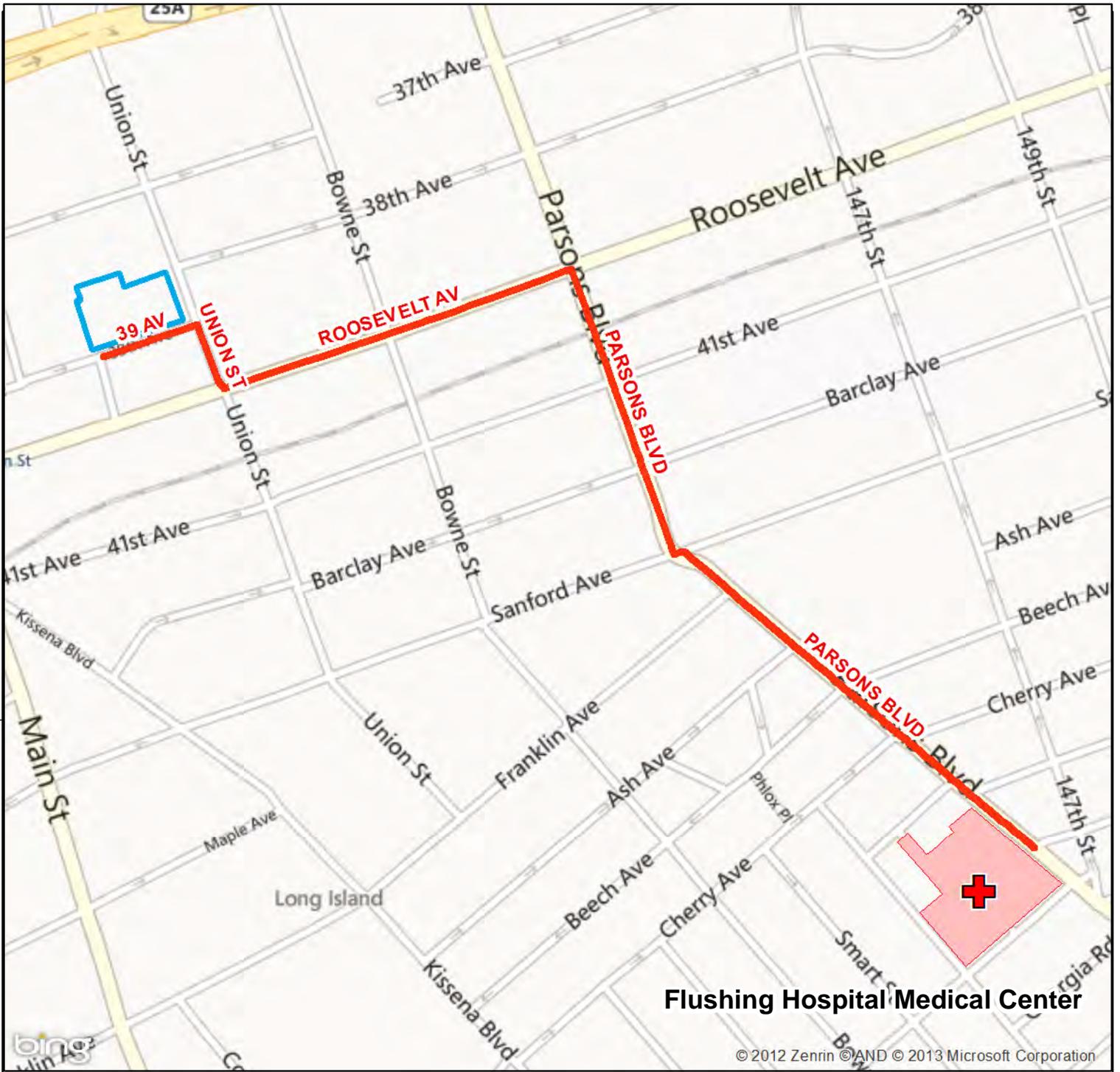
**9.3 CHASP Contact Information**

AKRF Project Director – Marc Godick.....	(914) 922-2356 (office)
AKRF Project Manager – Stephen Malinowski .....	(631) 574-3724 (office)
Site Safety Officer (SSO) – Erik Nimlos .....	(917) 613-5977 (cell)
Rockefeller Group Representative – Wendy Castro-Farrell.....	(212) 282-2016 (office) (office)
OER Project Manager – Shana Holberton .....	(212)788-3220
Ambulance, Fire and Police Departments.....	911
Local Poison Control .....	(212) 764-7667
	pm/weekend (212) 340-4494
NYCDEC Spill Response Team.....	(800) 457-7362
NYCDEP Hotline .....	(718) DEP-HELP



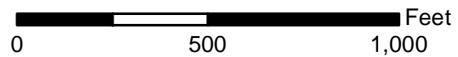
## **FIGURES**

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### Legend

-  Route to Hospital
-  Parcel 1A



Flushing Hospital Medical Center  
 4500 Parsons Blvd  
 Flushing, NY 11355

**Flushing Commons Parcel 1A**  
 Queens, New York



DATE  
**10/16/2013**

PROJECT No.  
**10677**

FIGURE  
**1**

**HOSPITAL LOCATION MAP**

Environmental Consultants  
 440 Park Avenue South, New York, N.Y. 10016

**APPENDIX A**  
**POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS**

**APPENDIX A**  
**POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS**

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 1,001 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

### What is benzene?

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

### What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

### How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Working in industries that make or use benzene.

### How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene will affect fertility in men.

### **How likely is benzene to cause cancer?**

Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia, often referred to as AML. This is a cancer of the blood-forming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen. The International Agency for Research on Cancer (IARC) and the EPA have determined that benzene is carcinogenic to humans.

### **How can benzene affect children?**

Children can be affected by benzene exposure in the same ways as adults. It is not known if children are more susceptible to benzene poisoning than adults.

Benzene can pass from the mother's blood to a fetus. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

### **How can families reduce the risks of exposure to benzene?**

Benzene exposure can be reduced by limiting contact with gasoline and cigarette smoke. Families are encouraged not to smoke in their house, in enclosed environments, or near their children.

### **Is there a medical test to determine whether I've been exposed to benzene?**

Several tests can show if you have been exposed to benzene. There is a test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood; however, since benzene disappears

rapidly from the blood, this test is only useful for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. The metabolite S-phenylmercapturic acid in urine is a sensitive indicator of benzene exposure. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

### **Has the federal government made recommendations to protect human health?**

The EPA has set the maximum permissible level of benzene in drinking water at 5 parts benzene per billion parts of water (5 ppb).

The Occupational Safety and Health Administration (OSHA) has set limits of 1 part benzene per million parts of workplace air (1 ppm) for 8 hour shifts and 40 hour work weeks.

### **References**

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Benzene (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is ethylbenzene?

(Pronounced ěth' əl bĕn' zĕn')

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

### What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

### How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

### How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

### How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

### How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

### How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

### Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and

some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

### Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,026 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What is lead?

(Pronounced lĕd)

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays.

Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

## What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.
- Much of the lead in inner-city soils comes from old houses painted with lead-based paint.

## How might I be exposed to lead?

- Eating food or drinking water that contains lead.
- Spending time in areas where lead-based paints have been used and are deteriorating.
- Working in a job where lead is used.
- Using health-care products or folk remedies that contain lead.
- Engaging in certain hobbies in which lead is used (for example, stained glass).

## How can lead affect my health?

Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed.

At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can also damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

## How likely is lead to cause cancer?

The Department of Health and Human Services has determined that lead acetate and lead phosphate may reasonably

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

be anticipated to be carcinogens based on studies in animals. There is inadequate evidence to clearly determine lead's carcinogenicity in people.

### How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. A large amount of lead might get into a child's body if the child ate small pieces of old paint that contained large amounts of lead. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

### How can families reduce the risk of exposure to lead?

Avoid exposure to sources of lead. Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint (homes built before 1978). Run your water for 15 to 30 seconds before drinking or cooking with it. This will get rid of lead that may have leached out of pipes. Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children. Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

### Is there a medical test to show whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth and bones can be measured with X-rays, but this test is not as readily available. Medical treatment may be necessary in children if the lead concentration in blood is higher than 45 micrograms per deciliter (45 µg/dL).

### Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that children ages 1 and 2 be screened for lead poisoning. Children who are 3 to 6 years old should be tested for lead if they have never been tested for lead before and if they receive services from public assistance programs; if they live in or regularly visit a building built before 1950; if they live in or visit a home built before 1978 that is being remodeled; or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers children to have an elevated level of lead if the amount in the blood is 10 µg/dL.

The EPA requires lead in air not to exceed 1.5 micrograms per cubic meter (1.5 µg/m<sup>3</sup>) averaged over 3 months. EPA limits lead in drinking water to 15 µg per liter.

The Occupational Health and Safety Administration (OSHA) develops regulations for workers exposed to lead. The Clean Air Act Amendments of 1990 banned the sale of leaded gasoline. The Federal Hazardous Substance Act bans children's products that contain hazardous amounts of lead.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about methyl *tert*-butyl ether (MTBE). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Methyl *tert*-butyl ether (MTBE) is a flammable liquid which is used as an additive in unleaded gasoline. Drinking or breathing MTBE may cause nausea, nose and throat irritation, and nervous system effects. MTBE has been found in at least 11 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is methyl *tert*-butyl ether?

(Pronounced məth'əl tūr'shē-ēr'ē byōōt'l ē'thər)

Methyl *tert*-butyl ether (MTBE) is a flammable liquid with a distinctive, disagreeable odor. It is made from blending chemicals such as isobutylene and methanol, and has been used since the 1980s as an additive for unleaded gasolines to achieve more efficient burning.

MTBE is also used to dissolve gallstones. Patients treated in this way have MTBE delivered directly to their gall bladders through special tubes that are surgically inserted.

### What happens to MTBE when it enters the environment?

- MTBE quickly evaporates from open containers and surface water, so it is commonly found as a vapor in the air.
- Small amounts of MTBE may dissolve in water and get into underground water.
- It remains in underground water for a long time.

- MTBE may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- MTBE may be broken down quickly in the air by sunlight.
- MTBE does not build up significantly in plants and animals.

### How might I be exposed to MTBE?

- Touching the skin or breathing contaminated air while pumping gasoline.
- Breathing exhaust fumes while driving a car.
- Breathing air near highways or in cities.
- Drinking, swimming, or showering in water that has been contaminated with MTBE.
- Receiving MTBE treatment for gallstones.

### How can MTBE affect my health?

Breathing small amounts of MTBE for short periods may cause nose and throat irritation. Some people exposed to MTBE while pumping gasoline, driving their cars, or working

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in gas stations have reported having headaches, nausea, dizziness, and mental confusion. However, the actual levels of exposure in these cases are unknown. In addition, these symptoms may have been caused by exposure to other chemicals.

There are no data on the effects in people of drinking MTBE. Studies with rats and mice suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects.

### **How likely is MTBE to cause cancer?**

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE as to its carcinogenicity.

### **Is there a medical test to show whether I've been exposed to MTBE?**

MTBE and its breakdown product, butyl alcohol, can be detected in your breath, blood, or urine for up to 1 or 2 days after exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. There is no other test specific to determining MTBE exposure.

### **Has the federal government made recommendations to protect human health?**

The EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4 milligrams per liter of water (4 mg/L) for an exposure of 1-10 days, and 3 mg/L for longer-term exposures.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an exposure limit of 40 parts of MTBE per million parts of air (40 ppm) for an 8-hour workday, 40-hour workweek.

### **Glossary**

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### **References**

This ToxFAQs information is taken from the 1996 Toxicological Profile for Methyl *tert*-Butyl Ether produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY:** Exposure to naphthalene happens mostly from breathing air contaminated from the burning of wood or fossil fuels, industrial discharges, tobacco smoke, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has been found in at least 536 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What is naphthalene?

(Pronounced năf'thə-lēn')

Naphthalene is a white solid that is found naturally in fossil fuels. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell.

The major products made from naphthalene are moth repellents. It is also used for making dyes, resins, leather, tanning agents, and the insecticide, carbaryl.

## What happens to naphthalene when it enters the environment?

- Naphthalene enters the environment from industrial uses, and from its use as a moth repellent.
- It also enters from the burning of wood or tobacco, and from accidental spills.
- Naphthalene evaporates easily.
- In air, moisture and sunlight break it down, often within 1 day.
- Naphthalene in water is destroyed by bacteria or evaporates into the air.
- Naphthalene binds weakly to soils and sediment.
- It does not accumulate in animals or fish.

- If dairy cows are exposed to naphthalene, some of it will be in their milk.
- If laying hens are exposed, some of it will be in their eggs.

## How might I be exposed to naphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or from burning wood or fossil fuels.
- Breathing air in homes or businesses where cigarettes are smoked, wood is burned, or moth repellents are used.
- Drinking water from contaminated wells.
- Touching clothing, blankets, or coverlets that are treated with naphthalene.

## How can naphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. People, particularly children, have developed this problem after eating naphthalene-containing moth-balls or deodorant blocks. Some of the symptoms of this

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problem are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin.

Animals sometimes develop cloudiness in their eyes after swallowing naphthalene. It is not clear if this also develops in people.

When mice were repeatedly exposed to naphthalene vapors for 2 years, their noses and lungs became inflamed and irritated.

### How likely is naphthalene to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) and the EPA have not classified naphthalene as to its human carcinogenicity.

No studies are available in people. Naphthalene has caused cancer in studies in female mice, but not in male mice or in rats of either sex.

### Is there a medical test to show whether I've been exposed to naphthalene?

Tests are available that measure levels of naphthalene and its breakdown products in urine, stool, blood, or maternal milk. A small sample of your body fat can also be removed and analyzed for naphthalene. These tests are not routinely available in a doctor's office. However, a sample taken in a doctor's office can be sent to a special laboratory, if needed.

These tests cannot determine exactly how much naphthalene you were exposed to or predict whether harmful effects will occur.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water containing over 0.5 parts of naphthalene per million parts of water (0.5 ppm) for more than 10 days, or 0.4 ppm for longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime, the EPA suggests it contain no more than 0.02 ppm naphthalene. The EPA requires that discharges or spills into the environment of 100 pounds or more be reported.

The Occupational Safety and Health Administration (OSHA) has set a limit of 10 parts per million (10 ppm) for the level of naphthalene in workplace air over an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) considers more than 250 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

### Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Insecticide: A substance that kills insects.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

### What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

### How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

### How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

### How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

### Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m<sup>3</sup>) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Sediments: Mud and debris that have settled to the bottom of a body of water.

Soluble: Dissolves in water.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

### What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

### How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

### How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

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have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

### How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

### Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

### Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m<sup>3</sup>) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Sediments: Mud and debris that have settled to the bottom of a body of water.

Soluble: Dissolves in water.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY:** Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

## What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

## How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smoke-houses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

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- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

### How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

### How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

### Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

### Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m<sup>3</sup>). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m<sup>3</sup> averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m<sup>3</sup> for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

### Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

### What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

### What happens to toluene when it enters the environment?

Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leaking underground storage tanks at gasoline stations and other facilities.

When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

Toluene does not usually stay in the environment long.

Toluene does not concentrate or buildup to high levels in animals.

### How might I be exposed to toluene?

Breathing contaminated workplace air or automobile exhaust.

Working with gasoline, kerosene, heating oil, paints, and lacquers.

Drinking contaminated well-water.

Living near uncontrolled hazardous waste sites containing toluene products.

### How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

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hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

### **How likely is toluene to cause cancer?**

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

### **How can toluene affect children?**

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

### **How can families reduce the risk of exposure to toluene?**

- Use toluene-containing products in well-ventilated areas.

- When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

### **Is there a medical test to show whether I've been exposed to toluene?**

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

### **Has the federal government made recommendations to protect human health?**

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

### **References**

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are fuel oils?

(Pronounced fyoo'el oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

## What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.

- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

## How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

## How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

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stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

### How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

### Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of

the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

### Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m<sup>3</sup>) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

### Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

### What happens to trichloroethylene when it enters the environment?

- ❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
- ❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
- ❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
- ❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- ❑ Trichloroethylene does not build up significantly in

plants and animals.

### How might I be exposed to trichloroethylene?

- ❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.
- ❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
- ❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
- ❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

### How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

### How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9<sup>th</sup> Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”

### Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood

and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

### Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

Solvent: A chemical that dissolves other substances.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

### What is tetrachloroethylene?

(Pronounced tět'rə-klôr' ǝ-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

### What happens to tetrachloroethylene when it enters the environment?

- Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- It does not appear to collect in fish or other animals that live in water.

### How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it.

### How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

### How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

### Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be per-

formed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

### Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

### Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

### References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about total petroleum hydrocarbons (TPH). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**HIGHLIGHTS: TPH is a mixture of many different compounds. Everyone is exposed to TPH from many sources, including gasoline pumps, spilled oil on pavement, and chemicals used at home or work. Some TPH compounds can affect your nervous system, causing headaches and dizziness. TPH has been found in at least 23 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).**

## What are total petroleum hydrocarbons?

(Pronounced tōt'l pə-trō'lē-əm hī'drə-kär'bənz)

Total petroleum hydrocarbons (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount of TPH at a site.

TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals.

Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. However, it is likely that samples of TPH will contain only some, or a mixture, of these chemicals.

## What happens to TPH when it enters the environment?

- TPH may enter the environment through accidents, from industrial releases, or as byproducts from commercial or private uses.
- TPH may be released directly into water through spills or leaks.
- Some TPH fractions will float on the water and form surface films.
- Other TPH fractions will sink to the bottom sediments.
- Bacteria and microorganisms in the water may break down some of the TPH fractions.
- Some TPH fractions will move into the soil where they may stay for a long time.

## How might I be exposed to TPH?

- Everyone is exposed to TPH from many sources.
- Breathing air at gasoline stations, using chemicals at home or work, or using certain pesticides.
- Drinking water contaminated with TPH.
- Working in occupations that use petroleum products.
- Living in an area near a spill or leak of petroleum products.
- Touching soil contaminated with TPH.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

### How can TPH affect my health?

Some of the TPH compounds can affect your central nervous system. One compound can cause headaches and dizziness at high levels in the air. Another compound can cause a nerve disorder called "peripheral neuropathy," consisting of numbness in the feet and legs. Other TPH compounds can cause effects on the blood, immune system, lungs, skin, and eyes.

Animal studies have shown effects on the lungs, central nervous system, liver, and kidney from exposure to TPH compounds. Some TPH compounds have also been shown to affect reproduction and the developing fetus in animals.

### How likely is TPH to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that one TPH compound (benzene) is carcinogenic to humans. IARC has determined that other TPH compounds (benzo[a]pyrene and gasoline) are probably and possibly carcinogenic to humans. Most of the other TPH compounds are considered not to be classifiable by IARC.

### Is there a medical test to show whether I've been exposed to TPH?

There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds. Exposure to kerosene can be determined by its smell on the breath or clothing. Benzene can be measured in exhaled air and a breakdown product of benzene can be measured in urine. Other TPH compounds can be measured in blood, urine, breath, and some body tissues.

### Has the federal government made recommendations to protect human health?

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds:

The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration has set an exposure limit of 500 parts of petroleum distillates per million parts of air (500 ppm) for an 8-hour workday, 40-hour workweek.

### Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Immune system: Body organs and cells that fight disease.

Pesticides: Chemicals used to kill pests.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for total petroleum hydrocarbons (TPH). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**HIGHLIGHTS:** Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. Xylene has been found in at least 844 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

### What is xylene?

There are three forms of xylene in which the methyl groups vary on the benzene ring: *meta*-xylene, *ortho*-xylene, and *para*-xylene (*m*-, *o*-, and *p*-xylene). These different forms are referred to as isomers.

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar. Chemical industries produce xylene from petroleum. It is one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

### What happens to xylene when it enters the environment?

- Xylene evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and other animals living in xylene-contaminated water.

### How might I be exposed to xylene?

- Using a variety of consumer products including gasoline, paint, varnish, shellac, rust preventives, and cigarette smoke. Xylene can be absorbed through the respiratory tract and through the skin.
- Ingesting xylene-contaminated food or water, although these levels are likely to be very low.
- Working in a job that involves the use of xylene such as painters, paint industry workers, biomedical laboratory workers, automobile garage workers, metal workers, and furniture refinishers.

### How can xylene affect my health?

No health effects have been noted at the background levels that people are exposed to on a daily basis.

High levels of exposure for short or long periods can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

### How likely is xylene to cause cancer?

Both the International Agency for Research on Cancer (IARC) and the EPA have found that there is insufficient information to determine whether or not xylene is carcinogenic.

### How can xylene affect children?

The effects of xylene have not been studied in children, but it is likely that they would be similar to those seen in exposed adults. Although there is no direct evidence, children may be more sensitive to acute inhalation exposure than adults because their narrower airways would be more sensitive to swelling effects.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

### How can families reduce the risks of exposure to xylene?

- Exposure to xylene as solvents (in paints or gasoline) can be reduced if the products are used with adequate ventilation and if they are stored in tightly closed containers out of the reach of small children.
- Sometimes older children sniff household chemicals in attempt to get high. Talk with your children about the dangers of sniffing xylene.
- If products containing xylene are spilled on the skin, then the excess should be wiped off and the area cleaned with soap and water.

### Is there a medical test to determine whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

### Has the federal government made recommendations to protect human health?

The EPA set a limit of 10 parts xylene per million parts drinking water (10 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 100 parts xylene per million parts of workplace air (100 ppm) for 8 hour shifts and 40 hour work weeks.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Xylene (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.**

**HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.**

### What is mercury?

(Pronounced mŭr/kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

### What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

### How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

### How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

### How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

### How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

### How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

### Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

### Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m<sup>3</sup>) and 0.05 mg/m<sup>3</sup> of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



**APPENDIX B**  
**WEST NILE VIRUS/St. LOUIS ENCEPHALITIS PREVENTION**

## WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the CDC Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

**APPENDIX C**  
**REPORT FORMS**

## WEEKLY SAFETY REPORT FORM

Week Ending: \_\_\_\_\_ Project Name/Number: \_\_\_\_\_

Report Date: \_\_\_\_\_ Project Manager Name: \_\_\_\_\_

Summary of any violations of procedures occurring that week:

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Summary of any job related injuries, illnesses, or near misses that week:

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Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

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Comments:

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Name: \_\_\_\_\_ Company: \_\_\_\_\_

Signature: \_\_\_\_\_ Title: \_\_\_\_\_



**INJURED - ILL:**

Name: \_\_\_\_\_ SSN: \_\_\_\_\_

Address: \_\_\_\_\_ Age: \_\_\_\_\_

Length of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Time/Classification: \_\_\_\_\_

**SEVERITY OF INJURY OR ILLNESS:**

\_\_\_ Disabling                      \_\_\_ Non-disabling                      \_\_\_ Fatality

\_\_\_ Medical Treatment                      \_\_\_ First Aid Only

**ESTIMATED NUMBER OF DAYS AWAY FROM JOB:** \_\_\_\_\_

**NATURE OF INJURY OR ILLNESS:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**CLASSIFICATION OF INJURY:**

- |                    |                       |                            |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions      | _____ Dislocations    | _____ Punctures            |
| ___ Bites          | _____ Faint/Dizziness | _____ Radiation Burns      |
| ___ Blisters       | _____ Fractures       | _____ Respiratory Allergy  |
| ___ Bruises        | _____ Frostbite       | _____ Sprains              |
| ___ Chemical Burns | _____ Heat Burns      | _____ Toxic Resp. Exposure |
| ___ Cold Exposure  | _____ Heat Exhaustion | _____ Toxic Ingestion      |
| ___ Concussion     | _____ Heat Stroke     | _____ Dermal Allergy       |
| ___ Lacerations    |                       |                            |

Part of Body Affected: \_\_\_\_\_

Degree of Disability: \_\_\_\_\_

Date Medical Care was Received: \_\_\_\_\_

Where Medical Care was Received: \_\_\_\_\_

Address (if off-site): \_\_\_\_\_

(If two or more injuries, record on separate sheets)

**PROPERTY DAMAGE:**

Description of Damage: \_\_\_\_\_

Cost of Damage:                   \$ \_\_\_\_\_

**ACCIDENT/INCIDENT LOCATION:** \_\_\_\_\_

**ACCIDENT/INCIDENT ANALYSIS:** Causative agent most directly related to accident/incident  
(Object, substance, material, machinery, equipment, conditions)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Was weather a factor?: \_\_\_\_\_

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

\_\_\_\_\_  
\_\_\_\_\_

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

\_\_\_\_\_

**ON-SITE ACCIDENTS/INCIDENTS:**

Level of personal protection equipment required in Site Safety Plan:

\_\_\_\_\_

Modifications:

Was injured using required equipment?:

\_\_\_\_\_

If not, how did actual equipment use differ from plan?:

\_\_\_\_\_  
\_\_\_\_\_

**ACTION TAKEN TO PREVENT RECURRENCE:** (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

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**ACCIDENT/INCIDENT REPORT REVIEWED BY:**

\_\_\_\_\_  
SSO Name Printed

\_\_\_\_\_  
SSO Signature

**OTHERS PARTICIPATING IN INVESTIGATION:**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ACCIDENT/INCIDENT FOLLOW-UP:**    Date: \_\_\_\_\_

Outcome of accident/incident: \_\_\_\_\_

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Physician's recommendations: \_\_\_\_\_

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Date injured returned to work: \_\_\_\_\_  
Follow-up performed by: \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM**

**APPENDIX D**  
**EMERGENCY HAND SIGNALS**

## EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

### EMERGENCY HAND SIGNALS

**OUT OF AIR, CAN'T BREATHE!**



**Hand gripping throat**

**LEAVE AREA IMMEDIATELY,  
NO DEBATE!**

**(No Picture) Grip partner's wrist or place both hands around waist**

**NEED ASSISTANCE!**



**Hands on top of head**

**OKAY! – I'M ALL RIGHT!**

**- I UNDERSTAND!**



**Thumbs up**

**NO! - NEGATIVE!**



**Thumbs down**

**APPENDIX B**  
**REPORT FORMS**

## WEEKLY SAFETY REPORT FORM

Week Ending: \_\_\_\_\_ Project Name/Number: \_\_\_\_\_

Report Date: \_\_\_\_\_ Project Manager Name: \_\_\_\_\_

Summary of any violations of procedures occurring that week:

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Summary of any job related injuries, illnesses, or near misses that week:

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Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

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Comments:

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Name: \_\_\_\_\_ Company: \_\_\_\_\_

Signature: \_\_\_\_\_ Title: \_\_\_\_\_



**INJURED - ILL:**

Name: \_\_\_\_\_ SSN: \_\_\_\_\_

Address: \_\_\_\_\_ Age: \_\_\_\_\_

Length of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Time/Classification: \_\_\_\_\_

**SEVERITY OF INJURY OR ILLNESS:**

\_\_\_ Disabling                      \_\_\_ Non-disabling                      \_\_\_ Fatality  
\_\_\_ Medical Treatment              \_\_\_ First Aid Only

**ESTIMATED NUMBER OF DAYS AWAY FROM JOB:** \_\_\_\_\_

**NATURE OF INJURY OR ILLNESS:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**CLASSIFICATION OF INJURY:**

___ Abrasions	_____ Dislocations	_____ Punctures
___ Bites	_____ Faint/Dizziness	_____ Radiation Burns
___ Blisters	_____ Fractures	_____ Respiratory Allergy
___ Bruises	_____ Frostbite	_____ Sprains
___ Chemical Burns	_____ Heat Burns	_____ Toxic Resp. Exposure
___ Cold Exposure	_____ Heat Exhaustion	_____ Toxic Ingestion
___ Concussion	_____ Heat Stroke	_____ Dermal Allergy
___ Lacerations		

Part of Body Affected: \_\_\_\_\_

Degree of Disability: \_\_\_\_\_

Date Medical Care was Received: \_\_\_\_\_

Where Medical Care was Received: \_\_\_\_\_

Address (if off-site): \_\_\_\_\_

(If two or more injuries, record on separate sheets)

**PROPERTY DAMAGE:**

Description of Damage: \_\_\_\_\_

Cost of Damage: \$ \_\_\_\_\_

**ACCIDENT/INCIDENT LOCATION:** \_\_\_\_\_

**ACCIDENT/INCIDENT ANALYSIS:** Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Was weather a factor?: \_\_\_\_\_

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

\_\_\_\_\_  
\_\_\_\_\_

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

\_\_\_\_\_

**ON-SITE ACCIDENTS/INCIDENTS:**

Level of personal protection equipment required in Site Safety Plan:

\_\_\_\_\_

Modifications:

Was injured using required equipment?:

\_\_\_\_\_

If not, how did actual equipment use differ from plan?:

\_\_\_\_\_  
\_\_\_\_\_

**ACTION TAKEN TO PREVENT RECURRENCE:** (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

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**ACCIDENT/INCIDENT REPORT REVIEWED BY:**

\_\_\_\_\_  
SSO Name Printed

\_\_\_\_\_  
SSO Signature

**OTHERS PARTICIPATING IN INVESTIGATION:**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ACCIDENT/INCIDENT FOLLOW-UP:**      Date: \_\_\_\_\_

Outcome of accident/incident: \_\_\_\_\_

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Physician's recommendations: \_\_\_\_\_

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Date injured returned to work: \_\_\_\_\_

Follow-up performed by:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM**

**APPENDIX C**  
**EMERGENCY HAND SIGNALS**

## EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

### EMERGENCY HAND SIGNALS

**OUT OF AIR, CAN'T BREATHE!**



**Hand gripping throat**

**LEAVE AREA IMMEDIATELY,  
NO DEBATE!**

( No Picture) Grip partner's wrist or place both hands around waist

**NEED ASSISTANCE!**



**Hands on top of head**

**OKAY! – I'M ALL RIGHT!**

**- I UNDERSTAND!**



**Thumbs up**

**NO! - NEGATIVE!**



**Thumbs down**